Shifting Milestones of Natural Sciences: The Ancient Egyptian Discovery of Algol's Period Confirmed

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Abstract

The Ancient Egyptians wrote Calendars of Lucky and Unlucky Days that assigned astronomically influenced prognoses for each day of the year. The best preserved of these calendars is the Cairo Calendar (hereafter CC) dated to 1244–1163 B.C. We have presented evidence that the 2.85 days period in the lucky prognoses of CC is equal to that of the eclipsing binary Algol during this historical era. We wanted to find out the vocabulary that represents Algol in the mythological texts of CC. Here we show that Algol was represented as Horus and thus signified both divinity and kingship. The texts describing the actions of Horus are consistent with the course of events witnessed by any naked eye observer of Algol. These descriptions support our claim that CC is the oldest preserved historical document of the discovery of a variable star. The period of the Moon, 29.6 days, has also been discovered in CC. We show that the actions of Seth were connected to this period, which also strongly regulated the times described as lucky for Heaven and for Earth. Now, for the first time, periodicity is discovered in the descriptions of the days in CC. Unlike many previous attempts to uncover the reasoning behind the myths of individual days, we discover the actual rules in the appearance and behaviour of deities during the whole year.

Introduction

The Ancient Egyptians referred to celestial events indirectly [1–4] by relating them to mythological events. Many prognoses in the Calendars of Lucky and Unlucky Days have been connected to astronomical observations [1, 5–7]. Such connections between astronomical events and prognosis texts have been uncovered in most cases only for individual days [6, 8, 9]. The $P_{\rm M} = 29.6$ days period of the *Moon* has been discovered in CC [10]. We have claimed that this document also contains the $P_{\rm A} = 2.85$ days period of the eclipsing binary *Algol* [11]. However, it not a straightforward task to identify those indirect mythological references that are influenced by *Algol* in CC. Here we present a statistical analysis that reveals which CC prognosis texts describe *Algol*'s regular variability.

The Ancient Egyptian year contained 12 months (M) of 30 days (D) and five additional "epagomenal" days. CC gives three prognoses for each D of every M (G = "gut"= "good" and S = "schlecht" = "bad") [11, 12]. CC also gives textual descriptions of the daily prognoses (S1 Fig). We study the dates of 28 selected words (hereafter SWs) in these mythological texts of CC. The dates are transformed into

series of time points t_i with equation (2). The P_A and P_M signals were originally discovered [11] from six large samples of lucky prognoses ($n = 6 \times 564 = 3384$). We use these six samples to determine the zero epochs t_E of equation (9) for the P_A and P_M signals. The time points leading to the discovery of these signals were close to phase, $\phi = 0$, of equation (5) using the ephemerides of equations (11) and (12) based on these zero epochs t_E. The lucky prognoses of each SW are a subsample of the above mentioned large samples of lucky prognoses. We compute an impact parameter z_x for the t_i of each SW with equation (10). The time points t_i of the lucky prognoses of any particular SW may strengthen (if $z_x > 0$) or weaken (if $z_x < 0$) the P_A and P_M signals. The impact parameter z_x is used for identifying the SWs having lucky prognoses close to phase, $\phi = 0$, computed with the ephemerides of equations (11) and (12). We will show that *Algol* and the *Moon* were at their brightest close to phase $\phi = 0$ with these two ephemerides. Hence, *Algol*'s eclipse and the New *Moon* occurred close to $\phi = 0.5$.

Our statistical analysis also confirms two general things regarding the origin of the mythological texts of CC. First, the appearances and feasts of various deities are not independent of the prognoses, or randomly assigned, but regulated by the same periodic patterns. Second, the deities are used to represent the same astronomical phenomena that were also used to choose the prognoses for the days of the year.

Materials

In this section, we transform the dates of 28 SWs in the mythological texts of CC into series of time points t_i. Our main aim is that all stages of the production of these data can be replicated. With these instructions, similar series of time points can be produced for any particular SW in CC or other similar calendars, where the SW dates are available. We create the data in two stages: Identification of SW dates and Transformation of SW dates into series of time points.

Identification of SW dates

CC is the best preserved Calendar of Lucky and unlucky Days. As in our two previous studies [10, 11], we use the best preserved continuous calendar found on pages recto III-XXX and verso I-IX of papyrus Cairo 86637. There are two CC translations, in English by Bakir [13] and in German by Leitz [12]. Our SWs have been identified according to the hieroglyphic transcription in Leitz [12] and the two aforementioned translations. In case of discrepancy we have consulted the photocopies of the original hieratic text given by Leitz [12]. For the sake of convenience, we quote sentences according to Bakir's English translation despite its imperfections because there is neither space nor reason to discuss the linguistic details of the text in the present article. This approach should ascertain that our study of the CC sentences is objective. In other words, we do not ourself translate any CC sentences into English, but we do check which individual Ancient Egyptian SWs were also identified by Bakir [13] and Leitz [12]. There is only one exception to our sentence quotation rule, i.e. the CC text connected to *Horus* where Bakir [13] did not identify *Horus*, but Leitz [12] and we did (Algol in lucky prognoses: the text at date $g_i(1, 10)$).

Naturally, we can not analyse all words in CC. Our main selection criterion is to include deities, nouns or locations that could have been used to indirectly describe periodic phenomena, due to their significant mythological properties and multiple occurrences in the text. Our list of SWs is not absolute and we give all the necessary information for other researchers to repeat our experiment on other SWs we may have ignored. Our 28 SWs in Ancient Egyptian language are given in Table 1.

Table 1. List of SWs in Ancient Egyptian language.

ꜣbḏw	*Abydos*	*ḥm*	*Majesty*
ḏdw	*Busiris*	*rmṯ*	*Man* (mankind, men)
tꜣ	*Earth* (ground, land)	*nwt*	*Nut*
ḫfty	*Enemy*	*nnw*	*Nun* (primeval waters)
psḏt	*Ennead*	*wnn-nfr*	*Onnophris*
irt	*Eye*	*wsir*	*Osiris*
ḫt	*Fire*	*rʿ*	*Re* (the Sun)
nsrt	*Flame*	*sbi*	*Rebel* (to rebel)
imyw-ḫt	*Followers* (following)	*sḫmt*	*Sakhmet*
ib	*Heart*	*stḫ*	*Seth*
pt	*Heaven* (sky)	*šw*	*Shu* (sunlight)
iwnw	*Heliopolis*	*sbk*	*Sobek*
ḥr	*Horus*	*ḏḥwty*	*Thoth*
mꜣi	*Lion*	*wḏꜣt*	*Wedjat*

We do not use the occurrences of our SWs in compound words and composite deities (e.g. House of Horus or Ra-Horakhti), because it is uncertain to which word, if not both, the prognosis is connected to. Our identifications of 28 SWs in CC are given in Table 2. It shows that all our 460 SW date identifications are the same as those made by Leitz [12] (Column 5: 460× "Yes"). However, 21 of our identifications were not made by Bakir [13] (Column 6: 21× "No": 1× "Earth", 2× "Enemy", 4× "Fire", 12× "Heart", 1× "Horus" and 1× "Osiris"). Fortunately, most days have combinations "GGG" or "SSS" and we know that the lucky or unlucky SW prognosis is certainly correct. We ignore the heterogeneous combinations "HET" (like "SSG"at $D = 6$ and $M = 1$), because the correct SW prognosis is uncertain. The dates with an unknown prognosis combination, "- - -", are naturally also ignored. Our notations for the number of lucky and unlucky dates for each SW are n_{G} and n_{S}. For example, "Abydos" has $n_{\mathrm{G}} = 3$ and $n_{\mathrm{S}} = 2$.

Table 2. SWs identified in CC.

SW	D	M	Prog	Ltz	Bkr
Abydos	13	3	SSS	Yes	Yes
Abydos	17	3	- - -	Yes	Yes
Abydos	11	4	GGG	Yes	Yes
Abydos	18	5	GGG	Yes	Yes
Abydos	27	6	- - -	Yes	Yes
Abydos	28	7	GGG	Yes	Yes
Abydos	13	8	SSS	Yes	Yes
Abydos	23	8	- - -	Yes	Yes
Busiris	26	2	SSS	Yes	Yes
Busiris	14	5	SSS	Yes	Yes
Busiris	26	5	SSS	Yes	Yes

The selected word (SW) identified on day (D) of month (M) in CC. The daily prognosis combinations (Prog) are "GGG" (All lucky), "SSS" (All unlucky), "- - -" (All unknown) or "HET" (Heterogeneous). The same SW was identified at the same date by Leitz [12] (Ltz="Yes" or "No") and by Bakir [13] (Bkr="Yes" or "No"). The twelve first lines of all 460 lines are shown here for guidance regarding the contents of this ASCII file which can be downloaded on Dryad (http://dx.doi.org/10.5061/dryad.tj4qg).

Transformation of SW dates into series of time points

The dating of CC does not influence the results of our currect analysis, because we transform the time points to unit vectors with equation (6). The mutual directions between these unit vectors do not depend on the chosen zero epoch t_0 in time. Adding any positive or negative constant value to these time points rotates all unit vectors with the same constant angle. Hence, our significance estimates of equations (8) and (13) do not depend on the connection between Gregorian and Egyptian days. The only assumption made in our equation (2) below is that the separation between two subsequent days is exactly one day during the particular year that CC happens to describe.

The transformation relations in equations (2) and (3) of Jetsu et al. [11] were

$$t_{\rm i} = N_{\rm E} - 1 + a_{\rm i}, \tag{1}$$

where $N_{\rm E} = 30(M-1) + D$ and $a_{\rm i}$ was a decimal part. This decimal part $a_{\rm i}$ was different for each of the three parts of the day. The $a_{\rm i}$ values depended on the chosen transformation between Egyptian and Gregorian year, and on the chosen day division. The $P_{\rm A}$ and $P_{\rm M}$ signals were discovered in samples of series of time points SSTP=1, 3, 5, 7, 9 and 11 in Jetsu et al. [11]. The size of each sample was $n = 564$. The period analysis results were the same for all these six samples, although their $a_{\rm i}$ values were different for every $N_{\rm E}$. The time points $t_{\rm i}$ of these six samples are given in Table 3.

Table 3. The time points $t_{\rm i}$ of lucky prognoses in Jetsu et al. [11].

SSTP=1	SSTP=3	SSTP=5	SSTP=7	SSTP=9	SSTP=11
0.080	0.095	0.076	0.120	0.142	0.114
0.239	0.284	0.227	0.359	0.426	0.341
0.399	0.473	0.379	0.739	0.784	0.727
1.080	1.095	1.076	1.120	1.142	1.113
1.240	1.284	1.227	1.360	1.425	1.340

The $t_{\rm i}$ values of SSTP=1, 3, 5, 7, 9 and 11 from Table 3 in Jetsu et al. [11]. The five first lines of all 534 lines are shown here for guidance regarding the contents of this ASCII file which can be downloaded on Dryad (http://dx.doi.org/10.5061/dryad.tj4qg).

The mean of the decimal parts a_i of all these $n = 6 \times 564 = 3384$ values of t_i is $m_t = 0.33$. In this study, the time point for an SW at the day D of the month M in CC is therefore computed from

$$t_i = t_i(D, M) = N_E - 1 + m_t. \quad (2)$$

This accuracy is sufficient, because we do not know to which part or parts of the day each SW refers to ($\sigma_t \approx \pm 0.^d5$) and some prognosis texts may refer to the previous or the next day ($\sigma_t \approx \pm 1.^d5$). The t_i of Table 3 ($n = 6 \times 564 = 3384$) are also later used to determine the zero epochs t_E for the ephemerides connected to the P_A and P_M signals (equations (11) and (12)). Our "synchronization" of time points of equations (1) and (2) ensures that these ephemerides enable us to identify the SWs connected to the P_A and P_M signals. For a given t value, the inverse transformation is

$$M = \mathrm{INT}[(t + 1 - m_t)/30] + 1 \quad (3)$$

$$D = t - m_t + 1 - 30(M - 1), \quad (4)$$

where INT removes the decimal part of $(t + 1 - m_t)/30$. In other words, if the analysis our data gives any particular t value, the D and M values of this t can be solved from equations (3) and (4).

The time points t_i for all dates with a "GGG" or "SSS" prognosis combination in CC are given in Table 4. These t_i are needed in computing the binomial distribution probabilities Q_B of equation (13).

Table 4. The time points t_i of all GGG and SSS dates in CC.

D	M	t_i	Prog
1	1	0.33	GGG
2	1	1.33	GGG
5	1	4.33	GGG
7	1	6.33	GGG
9	1	8.33	GGG
10	1	9.33	GGG
11	1	10.33	SSS
12	1	11.33	SSS
16	1	15.33	SSS
17	1	16.33	SSS

The day (D) and month (M) values in CC used in computing the time points (t_i) for the days with the prognosis (Prog) combinations "GGG" or "SSS". There are $N_G = 177$ and $N_S = 105$ days with a "GGG" and "SSS" combination, respectively. These data are from Table 1 in Jetsu et al. 2013 [11]. The ten first lines of all 282 lines are shown here for guidance regarding the contents of this ASCII file which can be downloaded on Dryad (http://dx.doi.org/10.5061/dryad.tj4qg).

Methods

Let us assume that time is a straight line, where events are equidistant dots with a separation of 2π. If this line is wound on a $d = 1$ diameter wheel, the dots line up at the same point on the wheel. Removing some dots produces gaps in the time line, but the remaining dots will still line up on the wheel. However, they will not line up on a $d \neq 1$ diameter wheel. This is an analogy for the Rayleigh test. It projects time points on a unit circle with the tested period P. These points line up in the same direction, if their time distribution is regular with the tested P.

Analysis

If the Rayleigh method discovers the period P in a series of time points points $\mathbf{t}= [t_1, t_2, ..., t_\mathrm{n}]$, it is possible to identify those subsamples $\mathbf{t}^*$ of n^* time points that strengthen this signal. In other words, the signal can be separated from noise. The phases of the n time points t_i are

$$\phi_\mathrm{i} = \mathrm{FRAC}[(t_\mathrm{i} - t_0)/P], \tag{5}$$

where t_0 is an arbitrary zero epoch and FRAC removes the integer part of $(t_\mathrm{i} - t_0)/P$. The unit vectors are

$$\mathbf{r}_\mathrm{i} = [\cos\Theta_\mathrm{i}, \sin\Theta_\mathrm{i}], \tag{6}$$

where $\Theta_\mathrm{i} = 360^\mathrm{o}\ \phi_\mathrm{i}$ are the phase angles. The test statistic of the Rayleigh test is

$$z = |\mathbf{R}|^2/n, \tag{7}$$

where vector $\mathbf{R} = \sum_{\mathrm{i}=1}^{\mathrm{n}} \mathbf{r}_\mathrm{i}$ points to $\Theta_\mathrm{R} = \mathrm{atan}(R_\mathrm{y}/R_\mathrm{x})$, $R_\mathrm{x} = \sum_{\mathrm{i}=1}^{\mathrm{n}} \cos\Theta_\mathrm{i}$ and $R_\mathrm{y} = \sum_{\mathrm{i}=1}^{\mathrm{n}} \sin\Theta_\mathrm{i}$. The corresponding phase is $\phi_\mathrm{R} = \Theta_\mathrm{R}/(360^\mathrm{o})$. Coinciding directions Θ_i give $|\mathbf{R}| = n$, while random Θ_i give $|\mathbf{R}| \approx 0$. The critical level (i.e. significance) of the Rayleigh test is

$$Q_\mathrm{z} = \mathrm{e}^{-z}. \tag{8}$$

We use the ephemeris zero epoch

$$t_\mathrm{E} = t_0 + P\phi_\mathrm{R}. \tag{9}$$

The mutual directions of $\mathbf{r}_\mathrm{i}$ and the length $|\mathbf{R}|$ are invariant for any constant shift of m_t, t_i, t_0 or t_E. Using the above t_E of equation (9), vector $\mathbf{R}$ points to $\Theta = \Theta_R = 0^\mathrm{o}$. All $\mathbf{r}_i$ with $-90^\mathrm{o} < \Theta_\mathrm{i} < 90^\mathrm{o}$ strengthen the P signal, while the remaining $\mathbf{r}_\mathrm{i}$ weaken it. The test statistic can be divided into $z = R_\mathrm{x}^2/n + R_\mathrm{y}^2/n$. We fix $t_0 = t_\mathrm{E}$ in equation (5) and compute the "impact" of any subsample $\mathbf{t}^*$ on the P signal from

$$z_\mathrm{x} = (R_\mathrm{x}/|R_\mathrm{x}|)(R_\mathrm{x}^2/n), \tag{10}$$

where R_x is computed only for the $n = n^*$ time points of $\mathbf{t}^*$. These $\mathbf{t}^*$ may strengthen ($z_\mathrm{x} > 0$) or weaken ($z_\mathrm{x} < 0$) the P signal, or represent noise ($z_\mathrm{x} \approx 0$).

Using the zero epoch $t_0 = 0$ for the $n = 6 \times 564$ time points t_i of the G prognoses in Table 3 gives the t_E values of Table 5 for the P_A and P_M signals with equation (9). These six large samples have $t_\mathrm{E} = 0.53 \pm 0.09$ for P_A and $t_\mathrm{E} = 3.50 \pm 0.09$ for P_M. Hence, we use the following two ephemerides

$$t_0 = t_\mathrm{E} = 0.53, \quad P = \quad P_\mathrm{A} = 2.85 \quad \text{(Algol)} \tag{11}$$

$$t_0 = t_\mathrm{E} = 3.50, \quad P = \quad P_\mathrm{M} = 29.6 \quad \text{(Moon)}. \tag{12}$$

Table 5. Values of t_E of the six samples

P	SSTP=1	SSTP=3	SSTP=5	SSTP=7	SSTP=9	SSTP=11
2.85	0.45	0.45	0.44	0.61	0.61	0.60
29.6	3.42	3.42	3.42	3.58	3.58	3.58

for computing the phases ϕ_i of equation (5). The lucky "GGG" prognoses of every SW are a subsample of the above six large samples of all "G" prognoses. We give the z and z_x values of equations (7) and (8) for any particular SW, if the analysed t_i of this SW reach $Q_z \leq 0.2$ with the ephemerides of equations (11) or (12). These periodicities are called weak if $0.05 < Q_z \leq 0.2$.

In our Figs. 1–13, we project the t_i of each SW to $\mathbf{r}_i = [\cos\Theta_i, \sin\Theta_i]$ on a unit circle, where time runs in the counter clock–wise direction. For the P_A signal, we define four points Aa, Ab, Ac and Ad. The first one, Aa, is at $\phi = 0 \equiv 0^o$ with the ephemeris of equation (11). The next three points Ab, Ac and Ad are separated by $\Delta\phi = 0.25 \equiv 90^o$. Vectors $\mathbf{r}_i$ pointing between Ad $\equiv -90^o$ and Ab $\equiv +90^o$ give $z_x > 0$ and strengthen P_A signal, the other ones weaken it. Because P_A equals $57^d/20$, the ϕ_i of t_i separated by multiples of 57 days are equal. For clarity, we shift such overlapping ϕ_i values by $\Delta\phi = 0.005$ away from each other in our Figs. 1 – 13. However, there are no such shifts in our computations. Our unambiguous terminology is:

"Connected to the P_A signal" $\equiv t_i$ of an SW strengthen the P_A signal $\equiv z_x \geq 1.0$ and $Q_z \leq 0.2$ with the ephemeris of equation (11).

"Connected to Algol" $\equiv t_i$ of an SW show periodicity with P_A, but their contribution to the P_A signal is insignificant when $0 \leq z_x < 1.0$ or they weaken this signal when $z_x < 0 \equiv z_x < 1.0$ and $Q_z \leq 0.2$ with the ephemeris of equation (11).

We use similar terminology for the *Moon* (equation (12)), and Ma–Md points similar to Aa–Ad.

Our notations for the lucky and unlucky time points t_i of each SW are g_i and s_i. The notations for their unit vectors $\mathbf{r}_i$ of equation (6) are $\mathbf{g}_i$ and $\mathbf{s}_i$, respectively. The critical level Q_z measures the probability for the concentration of *all* n_G and n_S directions of $\mathbf{g}_i$ and $\mathbf{s}_i$ of each SW. These directions are embedded within the directions of *all* $\mathbf{g}_i$ (Table 4: $N_G = 177$) and $\mathbf{s}_i$ (Table 4: $N_S = 105$). We first choose the direction Θ_R of $\mathbf{R}$ for some SW. Then we identify the n_1 directions of $\mathbf{g}_i$ or $\mathbf{s}_i$ of this SW that are among the n_2 of all N_G or N_S directions closest to Θ_R. For each SW, this gives the binomial distribution probability

$$Q_B = P(n_1, n_2, N) = \sum_{i=n_1}^{n_2} \binom{n_2}{i} q_B^i (1 - q_B)^{n_2 - i}, \tag{13}$$

where $N = N_G$ or N_S, and $q_B = n_G/N_G$ or n_S/N_S. This Q_B is the probability for that the directions of a particular SW occur n_1 times, or more, among all n_2 directions closest to Θ_R. Many Q_z estimates based on small samples (n_G or n_S) are unreliable, but the Q_B estimates based on large samples (Table 4: $N_G = 177$ or $N_S = 105$) are not.

All results of our analysis are given in S1 Table, where the results mentioned in text are marked with bold letters. The structure of S1 Table resembles the four panel structure of Figs 1–13. We give four separate tables for each SW. The results for the lucky and unlucky prognoses with P_A are those shown in figure panels "a" and "b". The corresponding results for P_M are shown in figure panels "c" and "d".

Results

Algol in lucky prognoses

Of all 28 SWs, only the lucky prognoses of *Horus*, *Re*, *Wedjat*, *Followers*, *Sakhmet* and *Ennead* unambiguously strengthen the $P_{\rm A}$ signal of *Algol*, because they have an impact of $z_{\rm x} \geq 1.0$ and a significance of $Q_{\rm z} \leq 0.2$ with the ephemeris of equation (11). The lucky prognoses of *Heliopolis* and *Enemy* are connected to *Algol* ($Q_{\rm z} \leq 0.2$), but they are not connected to the $P_{\rm A}$ signal ($z_{\rm x} < 1.0$). In this section, we discuss these eight SWs in the order of their impact on the $P_{\rm A}$ signal, i.e. in the order of decreasing $z_{\rm x}$ with the ephemeris of equation (11).

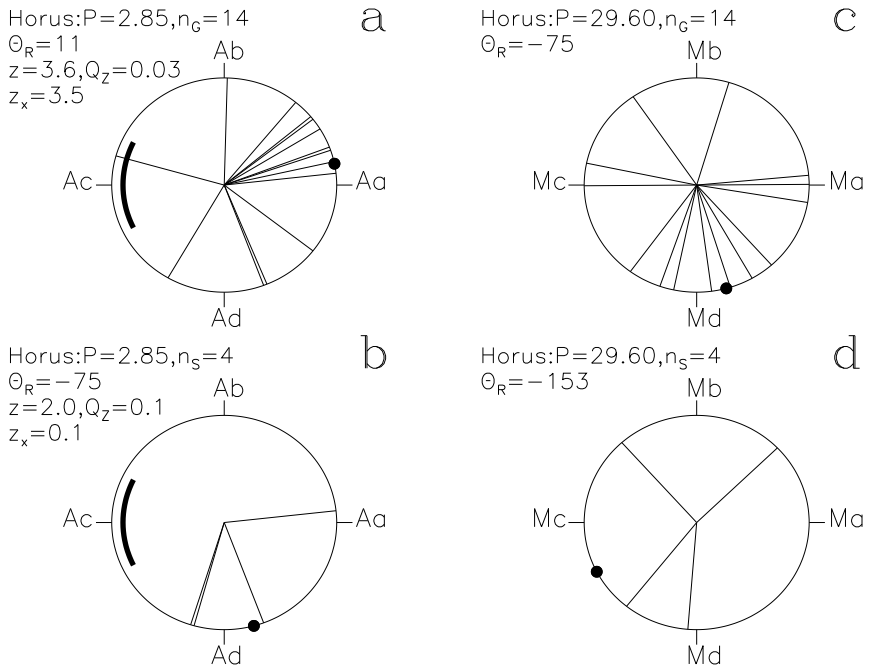

Figure 1. Horus. Time runs in the counter clock–wise direction on these unit circles. We give the z, $Q_{\rm z}$ and $z_{\rm x}$ values only when $Q_{\rm z} \leq 0.2$. The large black point indicates the $\Theta_{\rm R}$ direction. (a) $\mathbf{g}_{\rm i}$ with equation (11). Point Aa is at $\phi = 0 \equiv 0^{\rm o}$. The thick line centered on point Ac at $\phi = 0.5 \equiv 180^{\rm o}$ outlines the proposed phase for the 10 hr eclipse of Algol. (b) $\mathbf{s}_{\rm i}$ with equation (11). (c) $\mathbf{g}_{\rm i}$ with equation (12). Point Ma at $\phi = 0 \equiv 0^{\rm o}$ is close to the proposed Full *Moon* phase. (d) $\mathbf{s}_{\rm i}$ with equation (12)

Horus This SW has the largest impact $z_{\rm x} = +3.5$ on the $P_{\rm A}$ signal and the highest significance of the above eight SWs ($Q_{\rm z} = 0.03$, $n_{\rm G} = 14$). The unit vectors $\mathbf{g}_{\rm i}$ and $\mathbf{s}_{\rm i}$ of lucky and unlucky prognoses with the ephemeris of equation (11) are shown in Figs 1ab. Point Aa is at $\phi = 0 \equiv 0^{\rm o}$. Points Ab, Ac and Ad are separated by $\Delta\phi = 0.25 \equiv 90^{\rm o}$. Only the $\mathbf{g}_{\rm i}$ pointing between Ad $\equiv -90^{\rm o}$ and Ab $\equiv +90^{\rm o}$ strengthen the $P_{\rm A}$ signal. Twelve out of all fourteen $\mathbf{g}_{\rm i}$ are within this interval (Fig 1a). The four $\Theta_{\rm i}$ closest to $\Theta_{\rm R} = 11^{\rm o}$ reach a high significance of $Q_{\rm B} = 0.006$ ($n_1 = 4$, $n_2 = 10$, $N_{\rm G} = 177$). The $\mathbf{g}_{\rm i}$ pointing closest to Aa and giving the strongest impact on the $P_{\rm A}$ signal has the CC text [13]

$g_{\rm i}(14, 2) \equiv +6^{\rm o}$: *"It is the day of receiving the white crown by the Majesty of Horus; his Ennead is in great festivity."*

The texts [12, 13] for the next best $\mathbf{g}_{\rm i}$ closest to Aa are

$g_{\rm i}(19,12) \equiv +13^{\rm o}$: *"Horus has returned complete, nothing is missing in it."*

$g_{\rm i}(27,1) \equiv +19^{\rm o}$: *"Peace on the part of Horus with Seth."*

$g_{\rm i}(24,3) \equiv +19^{\rm o}$: *"He has given his throne to his son, Horus, in front of Re."*

$g_{\rm i}(1,7) \equiv +32^{\rm o}$: *"Feast of entering into heaven and the two banks. Horus is jubilating."*

$g_{\rm i}(15,11) \equiv +38^{\rm o}$: *"Horus hears your words in the presence of every god and goddess on this day."*

$g_{\rm i}(27,3) \equiv +38^{\rm o}$: *"Judging Horus and Seth; stopping the fighting."*

$g_{\rm i}(18,1) \equiv -38^{\rm o}$: *"It is the day of magnifying the majesty of Horus more than his brother, ..."*

$g_{\rm i}(1,9) \equiv +51^{\rm o}$: *"Feast of Horus son of Isis and ... his followers ... day"*

$g_{\rm i}(23,7) \equiv -69^{\rm o}$: *"Feast of Horus ... on this day of his years in his very beautiful images."*

$g_{\rm i}(29,3) \equiv -69^{\rm o}$: *"White crown to Horus, and the red one to Seth."*

$g_{\rm i}(7,9) \equiv +88^{\rm o}$: *"The crew follow Horus in the foreign land, examining its list ... therein when he smote him who rebelled against his master."*

$g_{\rm i}(1,10) \equiv -120^{\rm o}$: *"Horus ... Osiris ... Chentechtai ... land "*

$g_{\rm i}(28,3) \equiv +164^{\rm o}$: *"The gods are in jubilation and in joy when the will is written (lit. made) for Horus, ..."*

These passages of lucky prognoses are suggestive of *Algol* at its brightest. The *"white crown"*, *Horus* having *"returned complete"* and *"entering into heaven"* (i.e. into the sky) are not easy to explain as symbols for the eclipse. Among the $g_{\rm i}$ of all 28 SWs, the $g_{\rm i}$ of *Horus* are the "best hit" on Aa ($z_{\rm x} = +3.5$). If these $g_{\rm i}$ represent *Algol* at its brightest, then Aa is in the middle of this brightest phase and the thick line centered at Ac in Fig 1a outlines *Algol*'s eclipse. In this case, the $g_{\rm i}(7,9) \equiv +88^{\rm o}$ text may refer to an imminent eclipse and *"the will is written"* in $g_{\rm i}(28,3) \equiv +164^{\rm o}$ to the moment when the beginning of the eclipse is just becoming observable with naked eye. These passages could certainly describe naked eye observations of the regular changes of *Algol*.

Three $\mathbf{s}_{\rm i}$ of *Horus* in Fig 1b concentrate close to Ad and reach $Q_{\rm B} = 0.07$ ($n_1 = 3$, $n_2 = 25$, $N_{\rm S} = 105$). The fourth vector $\mathbf{s}_{\rm i}$ points close to Aa. Their CC texts [13] are

$s_{\rm i}(26,1) \equiv -107^{\rm o}$: *"... It is the day of Horus fighting with Seth. ..."*

$s_{\rm i}(11,11) \equiv -107^{\rm o}$: *"Introducing the great ones by Re to the booth to see what he had observed through the eye of Horus the elder. They were with heads bent down when they saw the eye of Horus being angry in front of Re."*

$s_{\rm i}(20,9) \equiv -69^{\rm o}$: *"Mat judges in front of these gods who became angry in the island of the sanctuary of Letopolis. The Majesty of Horus revised it."*

$s_{\rm i}(5,8) \equiv 6^{\rm o}$: *"The Majesty of Horus is well when the red one sees his form. As for anybody who approaches it, anger will start on it."*

If the $g_{\rm i}$ that described feasts were connected to the brightest phase of *Algol*, these $s_{\rm i}$ describing anger would have occurred after *Algol*'s eclipse. *"Horus is well"* for the last $s_{\rm i}(5,8)$ would seem natural for a lucky prognosis of *Horus* (as it should be close to Aa) but it is deemed unlucky for some other reasons. This type of "conflict of interest" prognoses may explain, why there are significant concentrations of directions accompanied by a few irregular directions (e.g. Fig 7c).

The $g_{\rm i}$ and $s_{\rm i}$ of *Horus* have $Q_{\rm z} > 0.2$ with the ephemeris of equation (12), and are therefore not connected to the *Moon*, except for some $g_{\rm i}$ texts mentioning both *Horus* and *Seth*. We argue that, as Leitz [12] also did, Mc $\equiv 180^{\rm o}$ in Fig 1c coincides with the New *Moon* (see paragraph *Seth*). All the aforementioned lucky prognoses mentioning both *Horus* and *Seth* are close to Md $\equiv -90^{\rm o}$ in Fig 1c, i.e. $g_{\rm i}(27,1) \equiv -82^{\rm o}$, $g_{\rm i}(27,3) \equiv -73^{\rm o}$ and $g_{\rm i}(29,3) \equiv -48^{\rm o}$ with the ephemeris of equation (12). The texts of these three days may describe the "luminosity competitions" between *Horus* and

Seth which come to an end when more than half of the lunar disk becomes illuminated immediately after Md. The legend of the Contendings of *Horus* and *Seth* [14] (hereafter LE1) has inspired these descriptions. The text *"White crown to Horus, and the red one to Seth"* in $g_{\rm i}(29,3)$ would describe the brightening of *Horus* with *Algol* (Fig. 1a: $\Theta = -69^{\rm o}$) and the brightening of *Seth* (Fig. 1c: $\Theta = -48^{\rm o}$) with the approaching Full *Moon* at Ma. The most simple explanation for the context of these texts is that the lucky prognoses of *Horus* are connected to *Algol* at its brightest.

Re The lucky prognoses reach $Q_{\rm z} = 0.07$ ($n_{\rm G} = 32$) with the ephemeris of equation (11) and give the second largest impact $z_{\rm x} = +2.5$ on the $P_{\rm A}$ signal (Fig 2a). Absence of small $Q_{\rm B}$ values, i.e. $\mathbf{g}_{\rm i}$ concentrations, may indicate that *Re* (the *Sun*) was casually following the undertakings of *Horus*. The $\mathbf{s}_{\rm i}$ of *Re* reach $Q_{\rm z} = 0.2$ ($n_{\rm S} = 26$) with the ephemeris of equation (12), and explicitly avoid Ma, the proposed Full *Moon* phase (Fig 2d).

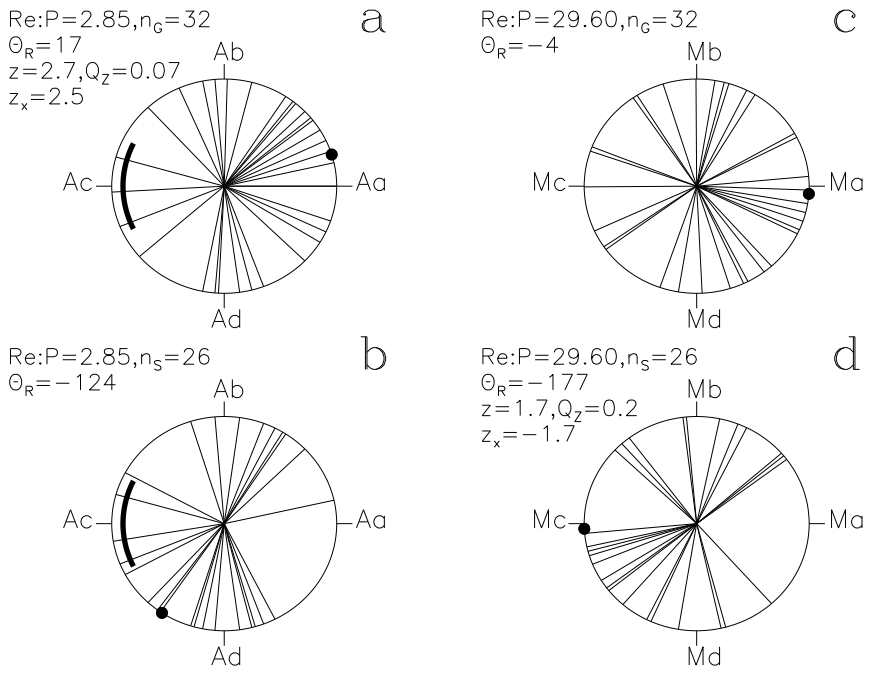

Figure 2. Re. otherwise as in Fig 1

Wedjat The lucky prognoses show weak periodicity ($Q_z = 0.1$, $n_G = 4$) with the ephemeris of equation (11). They give the third largest impact $z_x = +2.0$ on the P_A signal (Fig 3a). However, their impact on the P_M signal is even larger, $z_x = +2.9$ (Fig 3c). *Wedjat* may represent *Algol* observed at its brightest close to the Full *Moon*. The $\mathbf{g}_i$ and $\mathbf{s}_i$ distributions of *Horus* and *Wedjat* are similar (Figs 1ab and 3ab) with the ephemeris of equation (11). *Wedjat* is the Eye of Horus in Ancient Egyptian mythology.

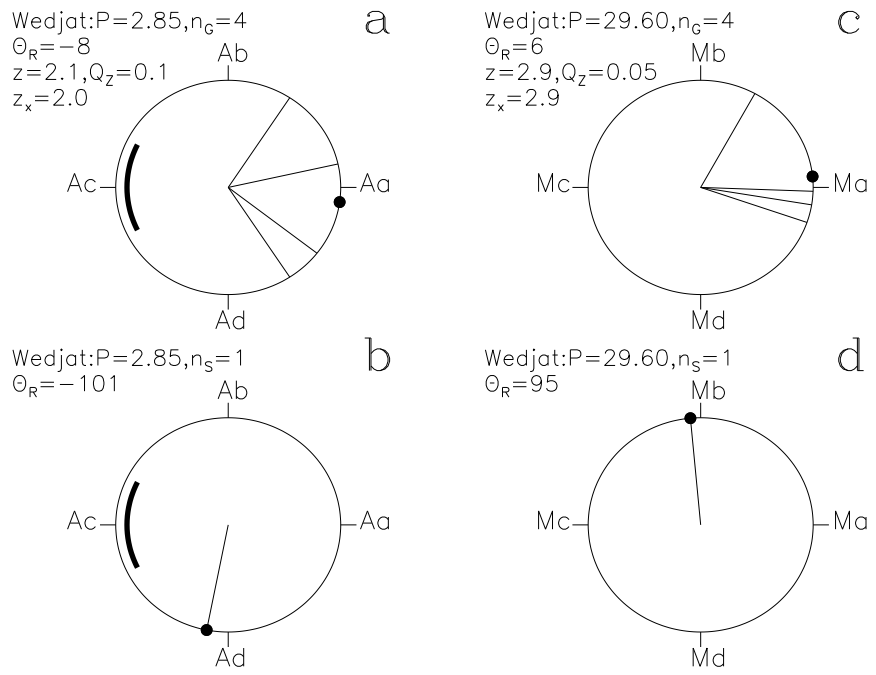

Figure 3. Wedjat. otherwise as in Fig 1

Followers The lucky prognoses have an impact of $z_{\rm x} = +1.4$ on the $P_{\rm A}$ signal (Fig 4a). This periodicity is weak ($Q_{\rm z} = 0.2$, $n_{\rm G} = 15$). Six $s_{\rm i}$ reach $Q_{\rm z} = 0.01$ (Fig. 4b). The five $\mathbf{s}_{\rm i}$ closest to $\Theta_{\rm R}$ reach a high significance of $Q_{\rm B} = 0.003$ ($n_1 = 5$, $n_2 = 18$, $N_{\rm S} = 105$) and may refer to an approaching eclipse of *Algol*. These $s_{\rm i}$ also show a weak connection to the *Moon* (Fig. 4d). It is tempting to suggest that *Followers* would be *Pleiades* following very close behind *Algol* in the revolving sky, e.g. in $g_{\rm i}(7, 9) \equiv 88^{\rm o}$ *"The crew follow Horus in the foreign land"* (Figs. 1a and 4a).

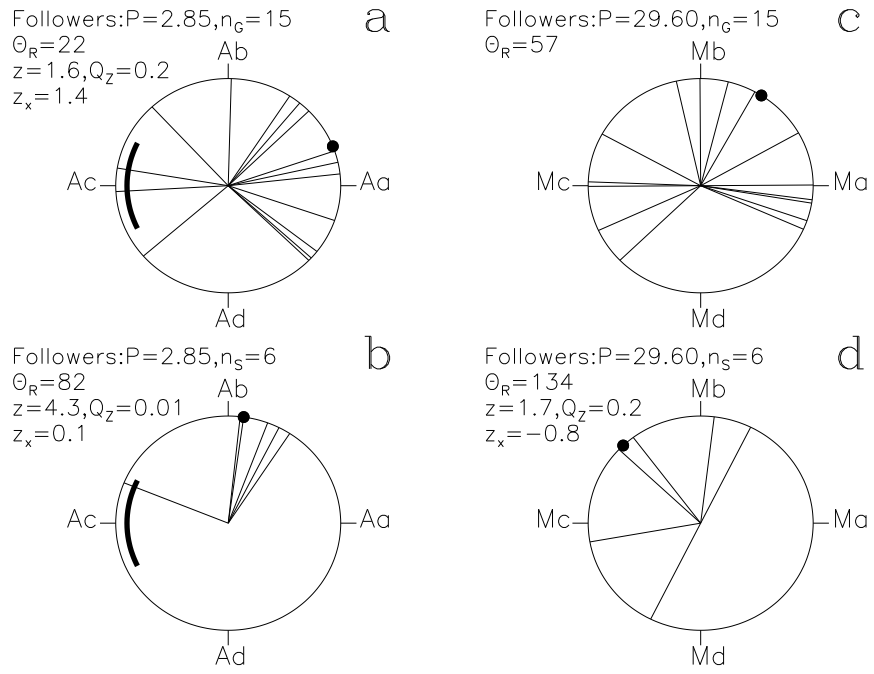

Figure 4. Followers. otherwise as in Fig 1

Sakhmet The g_i and s_i reach $Q_z = 0.06$ ($n_G = 4$) and 0.05 ($n_S = 3$) with the ephemeris of equation (11). The impact of g_i on the P_A signal is $z_x = +1.3$ (Fig. 5a). The three s_i at Ad, after the proposed eclipse at Ac, are strongly connected to *Algol*, because they reach the most extreme significance in this study, $Q_B = 0.0004$ ($n_1 = 3$, $n_2 = 6$, $N_S = 105$). The texts [13] are

$s_i(27, 8) \equiv -95^o$: *"Re sets because the Majesty of the goddess Sakhmet is angry in the land of Temhu."*

$s_i(13, 6) \equiv -82^o$: *"It is the day of the proceeding of Sakhmet to Letopolis. Her great executioners passed by the offerings of Letopolis on this day."*

$s_i(7, 10) \equiv -82^o$: *"It is the day of the executioners of Sakhmet."*

These three unlucky prognoses (Fig. 5b) are immediately followed by lucky ones (Fig. 5a). The $\mathbf{g}_i$ and $\mathbf{s}_i$ distributions of *Sakhmet* (Fig 5ab) resemble those of *Horus* (Fig 1ab) with the ephemeris of equation (11). The Eye of Horus (*Wedjat*) was transformed into the vengeful goddess *Sakhmet* in the legend [14] of the Destruction of Mankind (hereafter LE2). The $\mathbf{s}_i$ vectors of *Horus*, *Wedjat* and *Sakhmet* point close to Ad which is after *Algol*'s proposed eclipse at Ac (Figs 1b, 3b and 5b), and may refer to the abrupt pacification of enraged *Sakhmet* in LE2.

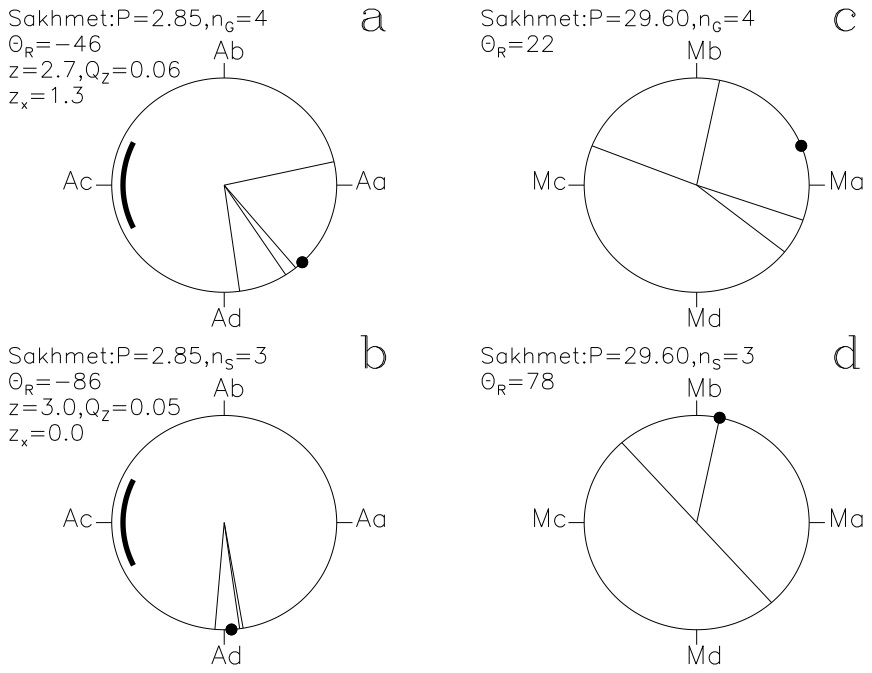

Figure 5. Sakhmet. otherwise as in Fig 1

Ennead The lucky prognoses show weak periodicity (Fig 6a: $Q_z = 0.1$,$n_G = 18$) and an impact of $z_x = +1.1$ on the P_A signal with the ephemeris of equation (11), as well as some concentration ($Q_B = 0.02$, $n_1 = 12$, $n_2 = 63$, $N_G = 177$). Ennead was a group of nine deities in Ancient Egyptian mythology. We discussed earlier, why *Followers* may have represented *Pleiades*. *Ennead* may have been another name for *Pleiades*, having the modern name "Seven sisters". However, the number of *Pleiades* members visible with naked eye depends on the observing conditions and the observer, the maximum number of such members being fourteen [15, 16]. The unlucky prognoses of *Followers* could be connected to *Pleiades* following the disappearing *Algol* before eclipse (Fig. 4b), while the unlucky prognoses of *Ennead* could be connected to *Algol* reappearing in front *Pleiades* after eclipse (Fig. 6b). Furthermore, the lucky prognosis distributions of *Followers* and *Ennead* are very similar (Figs. 4a and 6a).

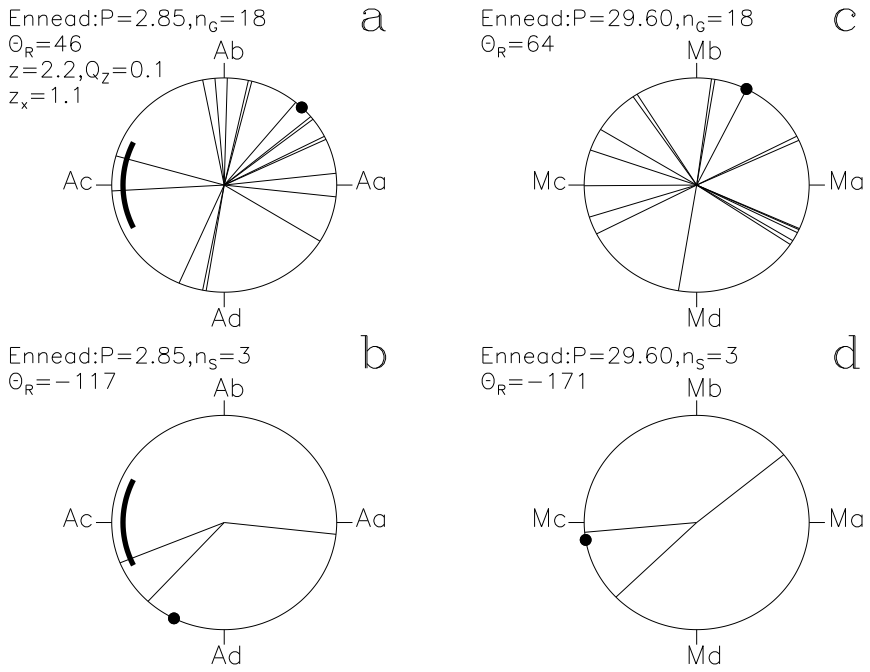

Figure 6. Ennead. otherwise as in Fig 1

Heliopolis The lucky prognoses show weak periodicity with P_A, but their impact on this signal is insignificant, $z_x = +0.2$, with the ephemeris of equation (11).

Enemy These lucky prognoses weaken the P_A signal, because their impact is $z_x = -1.0$ with the ephemeris of equation (11).

The Moon in lucky prognoses

We discuss the remaining other 20 SWs in this section and in sections

Algol in unlucky prognoses

The Moon in unlucky prognoses

No Algol or the Moon in lucky or unlucky prognoses

These SWs are discussed only briefly, because they are not connected to the $P_{\rm A}$ signal.

The lucky prognoses of *Earth*, *Heaven*, *Busiris*, *Rebel*, *Thoth* and *Onnophris* are connected to the $P_{\rm M}$ signal, because they have $z_{\rm x} \geq 1.0$ and $Q_{\rm z} \leq 0.2$ with the ephemeris of equation (12). The lucky prognoses of *Nut* are weakly connected to the *Moon*.

Earth These lucky prognoses reach the highest impact parameter value of this study, $z_{\rm x} = +5.3$, on the $P_{\rm M}$ signal. This periodicity also reaches the highest Rayleigh test significance of all, $Q_{\rm z} = 0.001$ ($n_{\rm G} = 19$). The good moments on *Earth* occurred before and during Ma, the proposed Full *Moon* phase (Fig 7c). The unlucky prognoses also show a weak connection to *Algol* (Fig. 7b: $Q_{\rm z} = 0.06$, $n_{\rm S} = 5$) and an even weaker connection to the *Moon* (Fig. 7d: $Q_{\rm z} = 0.2$, $n_{\rm S} = 5$).

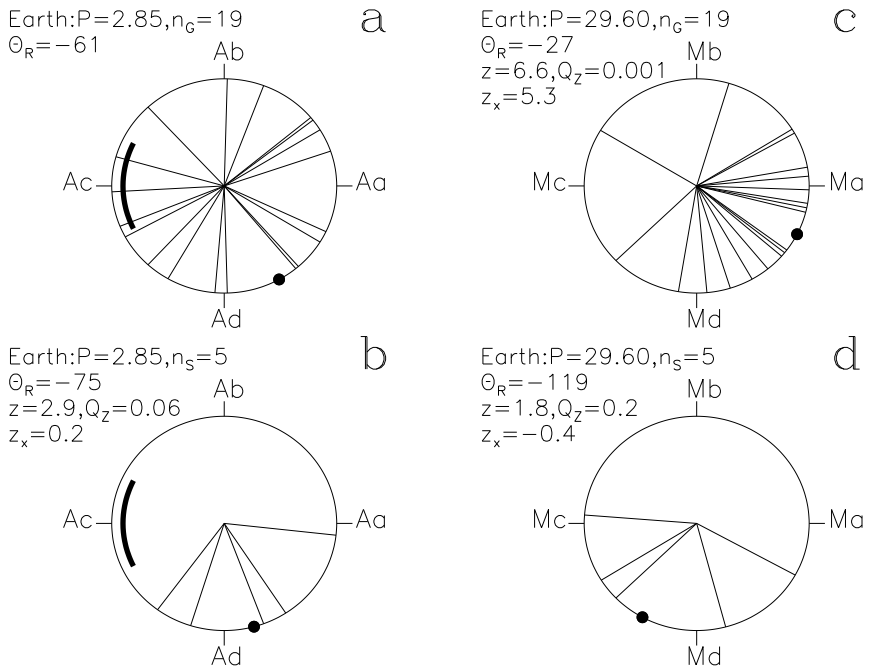

Figure 7. Earth. otherwise as in Fig 1

Heaven The second largest impact $z_{\mathrm{x}} = +3.4$ on the P_{M} signal comes from these lucky prognoses. Again, the good moments coincide with Ma, the proposed Full *Moon* phase (Fig 8c). This is significant periodicity ($Q_{\mathrm{z}} = 0.03$, $n_{\mathrm{G}} = 19$) combined with a very significant concentration ($Q_{\mathrm{B}} = 0.002$, $n_1 = 12$, $n_2 = 45$, $N_{\mathrm{G}} = 177$). The unlucky prognoses also show a weak connection to the *Moon* (Fig. 8d: $Q_{\mathrm{z}} = 0.06$, $n_{\mathrm{S}} = 4$).

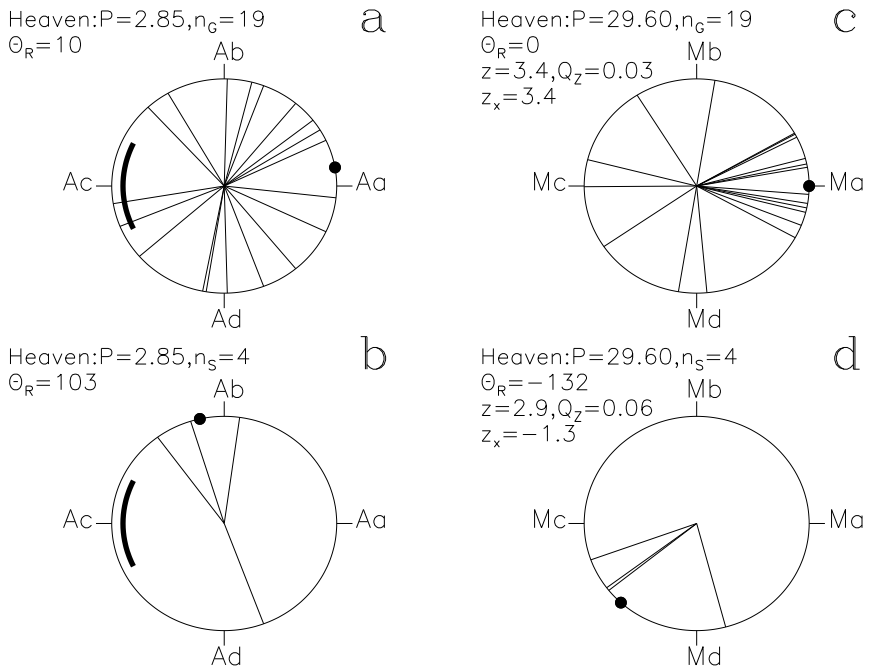

Figure 8. Heaven. otherwise as in Fig 1

Busiris The third largest impact on the $P_{\rm M}$ signal, $z_{\rm x} = +3.0$, comes from the lucky prognoses of *Busiris*. This periodicity reaches $Q_{\rm z} = 0.05$ ($n_{\rm G} = 4$) with the ephemeris of equation (12). And again, the lucky prognoses are close to Ma, the proposed Full *Moon* phase (Fig 9c)

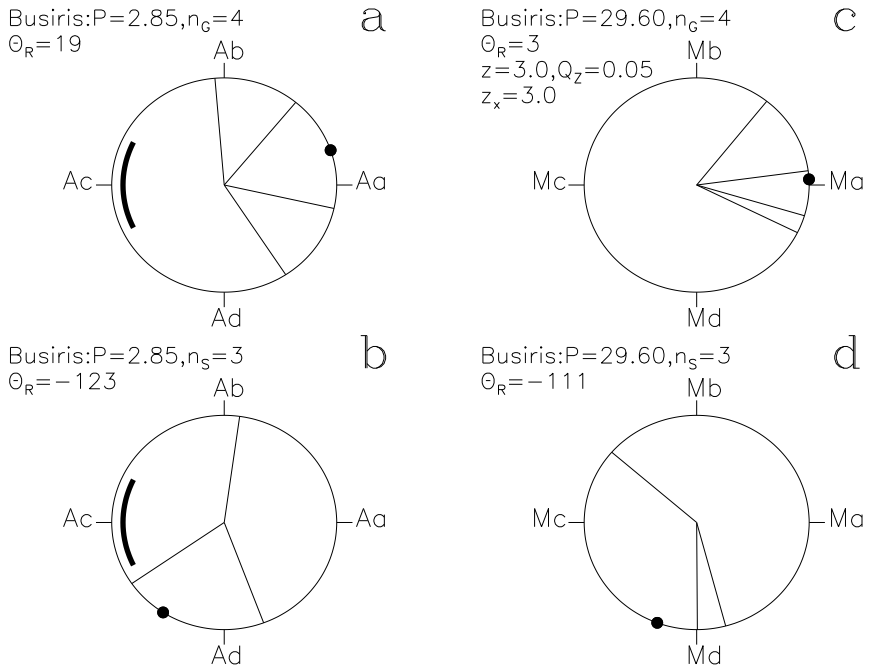

Figure 9. Busiris. otherwise as in Fig 1

Rebel The lucky prognoses show weak periodicity ($Q_{\rm z} = 0.2$, $n_{\rm G} = 3$) with the ephemeris of equation (12) and have an impact of $z_{\rm x} = 1.6$ on the $P_{\rm M}$ signal.

Thoth and Onnophris The lucky prognoses of these SW have a weaker impact on the $P_{\rm M}$ signal, i.e. $1.0 \leq z_{\rm x} \leq 1.3$ with the ephemeris equation (12).

Nut The lucky prognoses show a weak connection to the *Moon*. They have no impact on $P_{\rm M}$, because $z_{\rm x} = -0.1$ with the ephemeris of equation (12).

Algol in unlucky prognoses

The $P_{\rm A}$ and $P_{\rm M}$ signals were detected from the lucky prognoses $g_{\rm i}$ [10, 11]. It is therefore self–evident that the unlucky prognoses $s_{\rm i}$ had no impact on these two signals. However, this does not rule out the possibility that the $s_{\rm i}$ of some SW may be connected to *Algol* or the *Moon*. Most of these $\mathbf{s}_{\rm i}$ vectors point away from Aa or Ma, i.e. $z_{\rm x} < 0$ with the ephemerides of equations (11) or (12). *Man* and *Flame* are the only exceptions to this general rule ($z_{\rm x} \geq 0$).

Heart The unlucky prognoses have $z_{\rm x} = -3.1$ with the ephemeris of equation (11). They point towards Ac, the proposed eclipse phase of *Algol* (Fig 10b). This periodicity reaches a significance of $Q_{\rm z} = 0.04$ ($n_{\rm S} = 5$) and $Q_{\rm B} = 0.04$ ($n_1 = 5$, $n_2 = 39$, $N_{\rm S} = 105$).

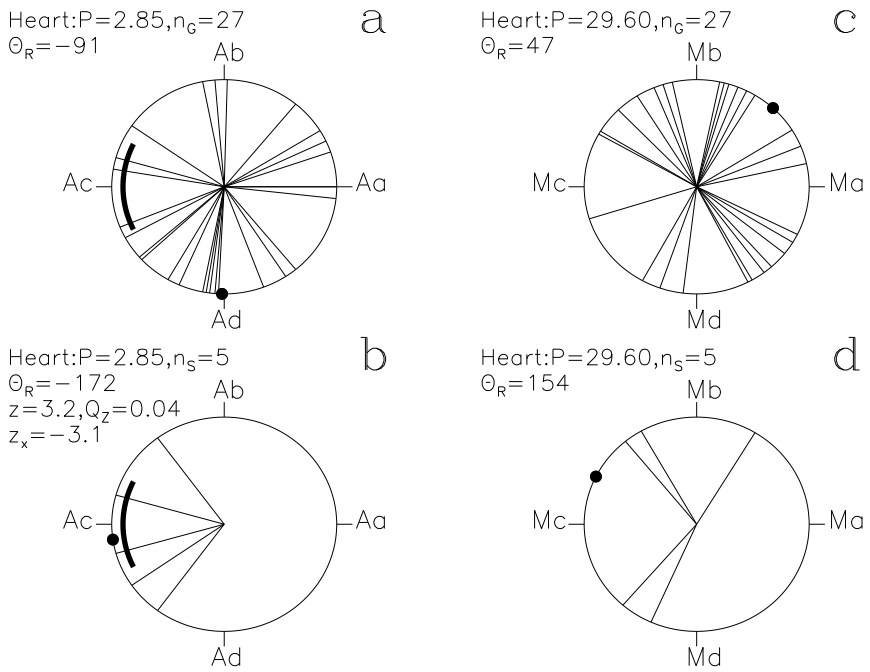

Figure 10. Heart. otherwise as in Fig 1

Nun The three unlucky prognoses of this SW reach $Q_{\rm z} = 0.06$ and a high significance of $Q_{\rm B} = 0.003$ ($n_1 = 3$, $n_2 = 11$, $N_{\rm S} = 105$) with the ephemeris of equation (11). They also show a weaker connection to the *Moon*.

The Moon in unlucky prognoses

We will first discuss the unlucky prognoses of SWs having negative $z_{\rm x}$ values with the ephemeris of equation (12), and then the two exceptions of *Man* and *Flame*.

Seth "See you on the dark side of the Moon" sums up the unlucky prognoses of *Seth* (Fig 11d). The significance is $Q_{\rm z} = 0.05$ ($n_{\rm S} = 9$) with the ephemeris of equation (12). Leitz [12] has argued that the following texts [13] at two consecutive days

$s_{\rm i}(16, 7) \equiv 173^{\rm o}$: *"Do not look, darkness being on this day (or, do not see darkness on this day)."*

$s_{\rm i}(17, 7) \equiv 185^{\rm o}$: *"Do not pronounce the name of Seth on this day."*

take place during the New *Moon*. The $\mathbf{s}_{\rm i}$ vectors of these two particular texts point at the opposite sides of Mc $\equiv 180^{\rm o}$, which supports both our "prediction" formula of equation (12) and Leitz' attribution [12] of the texts to the New *Moon*. We conclude that *Seth* is connected to the *Moon* and strongly suggest that Mc computed with equation (12) is close to the New *Moon*. Hence, the Full *Moon* is close to Ma.

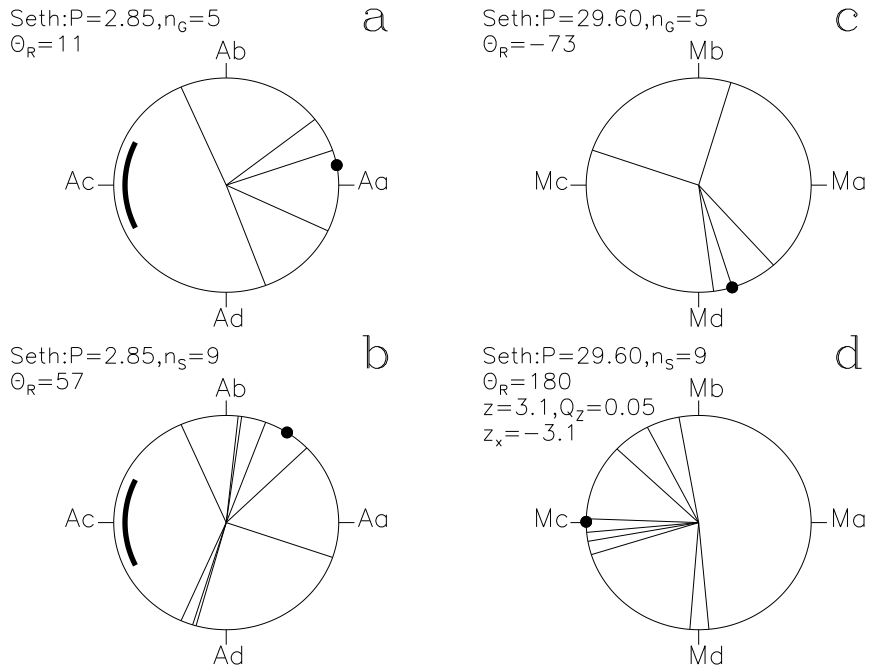

Figure 11. Seth. otherwise as in Fig 1

Osiris The four unlucky prognoses of this SW also point to the dark side of the *Moon*, assuming that Mc is close to the New *Moon* (Fig 12d). The significance estimates are $Q_z = 0.05$ ($n_S = 4$) and $Q_B = 0.02$ ($n_1 = 3$, $n_2 = 15$, $N_S = 105$) with the ephemeris of equation (12).

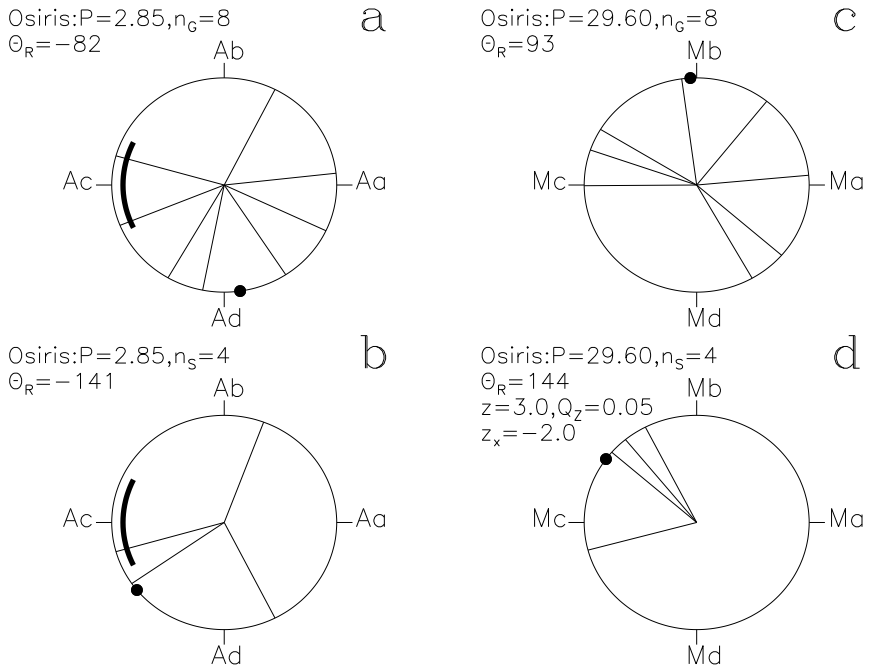

Figure 12. Osiris. otherwise as in Fig 1

Abydos and Lion These unlucky prognoses show a weak connection to the *Moon*.

Man The significance estimates for the unlucky prognoses are $Q_z = 0.02$ ($n_S = 6$) and $Q_B = 0.009$ ($n_1 = 5$, $n_2 = 23$, $N_S = 105$) with the ephemeris equation (12). These unlucky moments of *Man* concentrate on a few days after Ma, the proposed Full *Moon* phase (Fig 13d).

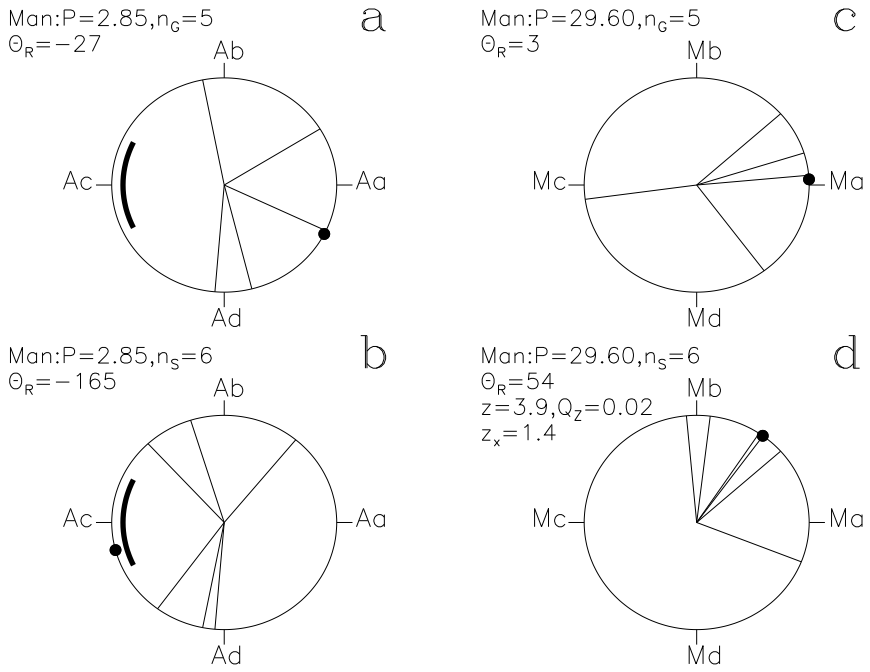

Figure 13. Man. otherwise as in Fig 1

Flame The significance estimates for these unlucky prognoses are $Q_z = 0.03$ ($n_S = 4$) and $Q_B = 0.003$ ($n_1 = 4$, $n_2 = 17$, $N_S = 105$) with the ephemeris of equation (12).

No Algol or the Moon in lucky or unlucky prognoses

Eye, Fire, Majesty, Shu and Sobek These SWs are not connected to *Algol* or the *Moon*, because their g_i and s_i have $Q_z > 0.2$ with the ephemerides of equations (11) and (12).

Some general remarks

This concludes our analysis of 28 SWs. Numerous other [7] SWs in CC need to be analysed in the future. Combining the inverse relations of equations (3) and (4) to the ephemerides of equations (11) and (12) will have countless applications. For example, the first eclipse of *Algol* would have occurred on $t(2.6, 1) = 1.96$ at $D = 2.1$ in $M = 1$ or the last New *Moon* on $t(14.6, 12) = 343.9$ at $D = 14.6$ in $M = 12$. Any question about CC can now be studied within this precise framework, e.g. was some meaning given to the nights when an eclipse of *Algol* (equation (11): $\phi = 0.5$) coincided with the New *Moon* (equation (12): $\phi = 0.5$)?

Discussion

Previously, we [11] applied four tests to the astrophysical hypothesis

H_1 : *"Period* $P_{\rm A} = 2.^{\rm d}850$ *in CC was* $P_{\rm orb}$ *of Algol."*

This is a summary of those tests:

TEST I: The mass transfer in this binary system should have increased the period in the past three millennia. The period value in CC is the first evidence for such an increase since Goodricke [17] discovered this periodicity over two centuries ago.

TEST II: The period change of 0.017 days from 2.850 to 2.867 days gives a reasonable estimate for the rate of this mass transfer.

TEST III: If eclipses were observed in Ancient Egypt, the orbital plane of the Algol A–B system must be nearly perpendicular to that of the Algol AB–C system [18, 19].

TEST IV: *Algol* and the *Moon* are the most probable objects, where naked eye observers could have discovered periodicity that we could then rediscover in CC.

TESTS I and IV supported H_1, while TESTS II and III indicated that it could be true.

Algol's observable night time mid eclipse epochs occur in groups of three separated with a period of 19 days and we also discovered this period in CC [11]. This phenomenon is displayed in Fig. 14. First, a mid eclipse epoch occurs in the end of the night. After three days, the next one occurs close to midnight. After another three days, a mid eclipse epoch occurs in the beginning of the night. Then, the next observable night-time mid eclipse epoch occurs after 13 days. Naked eye observations could easily lead to the discovery of this $3+3+13$ days regularity. One could speculate that this is one of the reasons, why the prime number 13 is still considered unlucky. This would be consistent with our result that, if the brightest phases of *Algol* were considered lucky then the eclipses (i.e. the dimmer phases) were considered unlucky. The 2.85 days period is exactly equal to 57/20 days. This means that after $57 = 3 \times 19$ days the eclipses returned exactly to the same moment of the night (see Fig. 14). All $D = 1$ days in CC have a prognosis combination "GGG", while all $D = 20$ days have "SSS". Perhaps this regular separation of 19 days was also inspired by *Algol*.

Only a skilled naked eye observer would have been able to discover the minor exceptions from the $3 + 3 + 13$ days regularity. *Algol*'s eclipses last $T_{A1} = 10$ hours. Naked eye can detect brightness differences of $0.^{\rm m}1$ in ideal observing conditions. Hence, an eclipse detection is theoretically *possible* for $T_{A2} = 7$ hours when *Algol* is more than $0.^{\rm m}1$ dimmer than its brightest suitable comparison star γ And (Fig. 14: tilted open triangle limits). This detection could become *certain* for $T_{A3} = 3$ hours when *Algol* is also at least $0.^{\rm m}1$ dimmer than all its other suitable comparison stars ζ Per, ϵ Per, γ Per, δ Per and β Tri (Fig. 14: tilted closed triangle limits). During the 57 days eclipse repetition cycle, only two mid eclipse epochs outside the 10 hour night time limits would qualify as *certain* observable eclipses (Fig. 14: open circles at 19th and 48th days). However, a *certain* detection of these two events would have been very difficult so close to dawn and dusk. The same argument is true for three additional *possible* eclipse detections (Fig. 14: open circles at 11th, 31st and 54th days).

Here, our statistical analysis of SWs giving the largest impact on the $P_{\rm A}$ signal reveals that *Algol* was represented as *Horus*. The lucky prognoses were most likely connected to *Algol*'s brightest phase. *Sakhmet* may have represented *Algol* after eclipses, and *Wedjat* during periods close to the Full *Moon*. To the Ancient Egyptians, *Algol*'s cycle may have symbolised the familiar events of LE1 and LE2. At Aa, *Re* sends the Eye of Horus (*Wedjat*) to destroy the rebels, as in LE2. At Ab, *Horus* enters the *"foreign land"* in $g_{\rm i}(7, 9)$, where he *"smote him who rebelled"*, as in LE1 or LE2. The *"will is written"* for him in $g_{\rm i}(28, 3)$ at the beginning of an eclipse – the only $\mathbf{g}_{\rm i}$ vector of *Horus* overlapping the thick line centered at Ac in Fig 1a. After an eclipse, *Wedjat* returns as *Sakhmet* who is pacified immediately after Ad, as in LE2. And a new cycle begins.

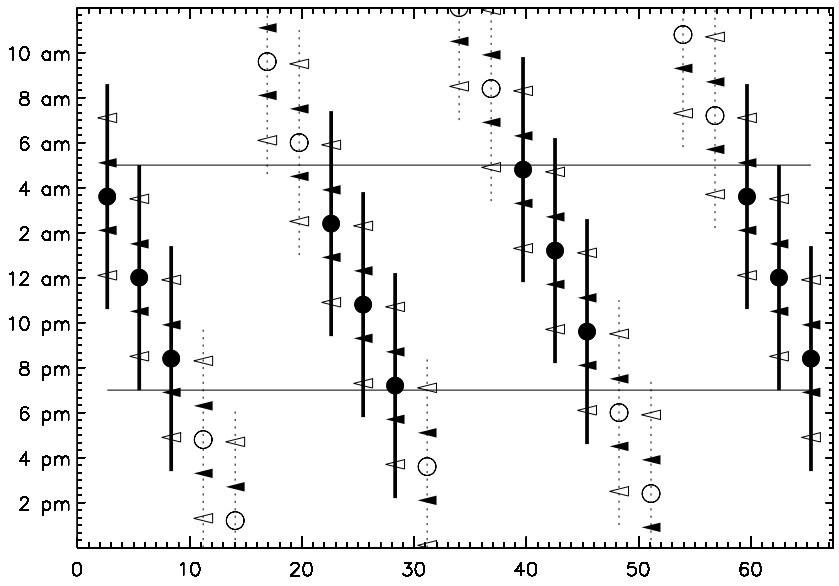

Figure 14. Eclipses of Algol with $P_{\rm A} = 2.85$ days. The horizontal continuous lines show the beginnings and ends of 10 hours long nights. The filled and open circles denote mid eclipse epochs occurring inside and outside such nights. The $T_{\rm A1} = 10$ hour time intervals of eclipses are denoted with thick continuous or thin dashed lines. The tilted open and closed triangles show the $T_{\rm A2} = 7$ and $T_{\rm A3} = 3$ hour limits.

Followers and *Ennead* may have represented *Pleiades*. Thus, these two, together with *Horus*, *Re*, *Wedjat* and *Sakhmet*, give the largest impact on the $P_{\rm A}$ signal.

The two periods, $P_{\rm A}$ and $P_{\rm M}$, regulate the assignment of mythological texts to specific days of the year. The *Moon* strongly regulates the times described as lucky for *Heaven* and for *Earth* (Figs 7c and 8c). The unlucky prognoses of *Seth* are clearly associated with the phases of the *Moon* (Fig 11d). Other SWs follow $P_{\rm A}$ or $P_{\rm M}$, like *Busiris*, *Heart*, *Osiris* and *Man* (Figs 9, 10, 12 and 13). We show no figures for *Heliopolis*, *Enemy*, *Rebel*, *Thoth*, *Onnophris*, *Nut*, *Nun*, *Abydos*, *Lion* and *Flame* which also reach $Q_{\rm z} \leq 0.2$ with $P_{\rm A}$ or $P_{\rm M}$. All these regularities can not simply be dismissed as a coincidence, let alone with the possible errors of $\sigma_{\rm t} \approx \pm 0.5$ or ± 1.5 days.

Conclusions

What was the origin of the phenomenon that occurred every third day, but always 3 hours and 36 minutes earlier than before, and caught the attention of Ancient Egyptians? Our statistical analysis leads us to argue that the mythological texts of CC contain astrophysical information about *Algol*. In 1596, Fabricius discovered the first variable star, *Mira*. Holwarda determined its eleven month period 44 years later. In 1669, Montanari discovered the second variable star, *Algol*. Goodricke [17] determined the 2.867 days period of *Algol* in 1783. All these astronomical discoveries were made with naked eye. Since then, they have become milestones of natural sciences. Our statistical analysis of CC confirms that all these milestones should be shifted about three millennia backwards in time.

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Data Availability: The authors confirm that all data underlying these findings are fully available without restriction. Tables 2–4 and the Python 3.0 program *tableS1.py* have been deposited to Dryad (http://dx.doi.org/10.5061/dryad.tj4qg).

Supporting Information

S1 Fig

Text of Cairo Calendar page rto VIII. Inside our superimposed rectangle is the hieratic writing for the word *Horus*. Reprinted from Leitz [12] under a CC BY license, with permission from Harrassowitz Verlag, original copyright [1994].

S1 Table

Analysis results for all SWs Day (D), month (M) of lucky (g_i) and unlucky (s_i) time points, their phase (ϕ_i), phase angle (Θ_i), direction of their **R** vector (Θ_R) and differences $\Delta\Theta_\mathrm{i} = \Theta_\mathrm{i} - \Theta_\mathrm{R}$ with Eq (11) for $P_\mathrm{A} = 2.85$ days and Eq (12) for $P_\mathrm{M} = 29.6$ days. The binomial distribution parameters are n_1, n_2, q_B for Q_B. Note that the parameters are given in the order of increasing $\Delta\Theta_\mathrm{i}$, n_1 and n_2. All values mentioned in text are marked in bold. We also make available the code of a Python 3.0 program *tableS1.py* which can be downloaded on Dryad (http://dx.doi.org/10.5061/dryad.tj4qg). This program can be used to reproduce and replicate all analysis results given in S1 Table.

Horus: $n_G = \mathbf{14}$, $N_G = \mathbf{177}$, $q_B = 0.0791$

$P = 2.85$, $\Theta_R = 11$
Periodicity: $z = 3.6$, $Q_z = \mathbf{0.03}$, $z_x = \mathbf{3.5}$

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
19	12	348.33	0.04	**13**	1	1	4	0.2808
14	2	43.33	0.02	**6**	5	2	5	0.0532
27	1	26.33	0.05	**19**	7	3	9	0.0289
24	3	83.33	0.05	**19**	7	**4**	**10**	**0.0056**
1	7	180.33	0.09	**32**	20	5	29	0.0747
27	3	86.33	0.11	**38**	26	6	40	0.0928
15	11	314.33	0.11	**38**	26	7	43	0.0503
1	9	240.33	0.14	**51**	39	8	57	0.0788
18	1	17.33	-0.11	**-38**	49	9	68	0.0869
7	9	246.33	0.25	**88**	77	10	95	0.2180
29	3	88.33	-0.19	**-69**	81	11	98	0.1515
23	7	202.33	-0.19	**-69**	81	12	99	0.0912
1	10	270.33	-0.33	**-120**	131	13	142	0.3332
28	3	87.33	0.46	**164**	153	14	155	0.3428

$P = 29.60$, $\Theta_R = -75$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
27	3	86.33	-0.20	**-73**	2	1	2	0.1519
27	1	26.33	-0.23	**-82**	8	2	7	0.1006
28	3	87.33	-0.17	-60	14	3	16	0.1279
29	3	88.33	-0.13	**-48**	26	4	25	0.1311
23	7	202.33	-0.28	-102	27	5	26	0.0503
24	3	83.33	-0.30	-109	34	6	36	0.0613
19	12	348.33	-0.35	-126	51	7	54	0.1322
1	7	180.33	-0.03	-9	65	8	67	0.1581
1	9	240.33	0.00	0	75	9	79	0.1712
1	10	270.33	0.01	5	80	10	85	0.1337
15	11	314.33	-0.50	-180	105	11	110	0.2529
18	1	17.33	0.47	168	117	12	119	0.2317
7	9	246.33	0.20	73	148	13	148	0.3890
14	2	43.33	0.35	124	161	14	159	0.3785

Horus: $n_S = 4$, $N_S = \mathbf{105}$, $q_B = 0.0381$

$P = 2.85$, $\Theta_R = -75$
Weak periodicity: $z = 2.0$, $Q_z = 0.1$, $z_x = 0.1$

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
20	9	259.33	-0.19	**-69**	5	1	5	0.1765
26	1	25.33	-0.30	**-107**	33	2	21	0.1897
11	11	310.33	-0.30	**-107**	33	**3**	**25**	**0.0681**
5	8	214.33	0.02	**6**	81	4	49	0.1159

$P = 29.60$, $\Theta_R = -153$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
20	9	259.33	-0.36	-129	24	1	23	0.5907
26	1	25.33	-0.26	-95	58	2	42	0.4788
11	11	310.33	0.37	132	76	3	57	0.3705
5	8	214.33	0.12	44	163	4	97	0.5077

Re: $n_G = \mathbf{31}$, $N_G = 177$, $q_B = 0.1751$

$P = 2.85$, $\Theta_R = 23$
Periodicity: $z = 2.9$, $Q_z = \mathbf{0.05}$, $z_x = \mathbf{2.5}$

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
17	2	46.33	0.07	25	2	1	1	0.1751
24	3	83.33	0.05	19	4	2	8	0.4217
25	10	294.33	0.09	32	8	3	16	0.5496
1	5	120.33	0.04	13	11	4	19	0.4324
27	3	86.33	0.11	38	15	5	23	0.3766
24	5	143.33	0.11	38	15	6	24	0.2337
8	10	277.33	0.12	44	21	7	31	0.2934
21	3	80.33	0.00	0	23	8	34	0.2350
9	11	308.33	0.00	0	23	9	36	0.1664
10	3	69.33	0.14	51	27	10	37	0.0998
25	12	354.33	0.14	51	27	11	40	0.0783
3	2	32.33	0.16	57	34	12	44	0.0716
21	1	20.33	-0.05	-19	42	13	55	0.1543
19	8	228.33	-0.07	-25	48	14	64	0.2209
6	2	35.33	0.21	76	53	15	67	0.1848
2	6	151.33	-0.09	-32	55	16	72	0.1831
19	1	18.33	0.25	88	65	17	80	0.2275
10	12	339.33	-0.12	-44	67	18	88	0.2725
9	2	38.33	0.26	95	72	19	89	0.2053
2	1	1.33	0.28	101	78	20	95	0.2164
9	4	98.33	0.32	114	91	21	107	0.3194
29	3	88.33	-0.19	-69	93	22	110	0.2813
24	12	353.33	-0.21	-76	99	23	116	0.2904
3	10	272.33	0.37	133	109	24	120	0.2700
9	1	8.33	-0.26	-95	118	25	127	0.2929
3	5	122.33	-0.26	-95	118	26	129	0.2460
13	4	102.33	-0.28	-101	124	27	137	0.2811
25	5	144.33	0.46	164	141	28	147	0.3444
1	4	90.33	-0.49	-177	160	29	160	0.4516
10	2	39.33	-0.39	-139	162	30	163	0.4139
1	6	150.33	-0.44	-158	179	31	175	0.5032

$P = 29.60$, $\Theta_R = -7$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
3	2	32.33	-0.03	-9	3	1	6	0.6850
2	6	151.33	-0.01	-2	5	2	9	0.4854
1	6	150.33	-0.04	-14	7	3	14	0.4549
3	5	122.33	0.01	5	12	4	20	0.4743
1	5	120.33	-0.05	-19	12	5	22	0.3390
1	4	90.33	-0.07	-24	17	6	29	0.3988
2	1	1.33	-0.07	-26	20	7	32	0.3236
6	2	35.33	0.08	27	34	8	49	0.6446
3	10	272.33	0.08	30	36	9	53	0.5969
29	3	88.33	-0.13	-48	41	10	61	0.6431
25	12	354.33	-0.15	-53	46	11	65	0.6006
25	10	294.33	-0.17	-63	56	12	72	0.6231
24	12	353.33	-0.18	-65	58	13	76	0.5844
9	1	8.33	0.16	59	66	14	81	0.5673
27	3	86.33	-0.20	-73	66	15	83	0.4916
9	2	38.33	0.18	64	70	16	87	0.4583
9	4	98.33	0.20	73	80	17	97	0.5405
25	5	144.33	-0.24	-87	80	18	99	0.4716
10	2	39.33	0.21	76	83	19	101	0.4055
10	3	69.33	0.22	81	87	20	106	0.3955
24	5	143.33	-0.28	-99	93	21	111	0.3861
8	10	277.33	0.25	90	97	22	116	0.3771
24	3	83.33	-0.30	-109	102	23	121	0.3684
9	11	308.33	0.30	107	114	24	130	0.4235
13	4	102.33	0.34	122	129	25	139	0.4765
10	12	339.33	0.35	124	131	26	143	0.4508
21	3	80.33	-0.40	-146	139	27	146	0.4110
19	8	228.33	-0.40	-146	139	28	147	0.3444
21	1	20.33	-0.43	-155	148	29	153	0.3512
17	2	46.33	0.45	161	168	30	165	0.4423
19	1	18.33	-0.50	-180	173	31	172	0.4614

Re: $n_S = \mathbf{26}$, $N_S = 105$, $q_B = 0.2476$

$P = 2.85$, $\Theta_R = -124$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
23	1	22.33	-0.35	-126	3	1	1	0.2476
20	3	79.33	-0.35	-126	3	2	2	0.0613
15	12	344.33	-0.37	-133	9	3	8	0.3155
20	5	139.33	-0.30	-107	16	4	13	0.4078
11	11	310.33	-0.30	-107	16	5	15	0.3057
10	6	159.33	-0.28	-101	23	6	19	0.3233
27	2	56.33	-0.42	-152	28	7	21	0.2480
27	8	236.33	-0.26	-95	29	8	24	0.2253
7	2	36.33	-0.44	-158	34	9	25	0.1428
7	10	276.33	-0.23	-82	41	10	33	0.2880
24	2	53.33	-0.47	-171	47	11	34	0.2011
12	1	11.33	-0.21	-76	48	12	36	0.1586
9	3	68.33	-0.21	-76	48	13	37	0.1045
26	5	145.33	-0.19	-69	54	14	40	0.0969
19	4	108.33	-0.18	-63	60	15	42	0.0751
16	11	315.33	0.46	164	72	16	49	0.1336
3	12	332.33	0.42	152	85	17	58	0.2531
22	1	21.33	0.30	107	129	18	78	0.6766
22	10	291.33	0.04	13	136	19	84	0.7145
6	4	95.33	0.26	95	142	20	85	0.6444
11	12	340.33	0.23	82	154	21	90	0.6623
7	7	186.33	0.19	69	167	22	96	0.6993
20	2	49.33	0.12	44	168	23	98	0.6542
11	10	280.33	0.18	63	173	24	101	0.6295
21	9	260.33	0.16	57	180	25	104	0.6051
18	11	317.33	0.16	57	180	26	105	0.5375

$P = 29.60$, $\Theta_R = -177$
Weak periodicity: $z = 1.7$, $Q_z = \mathbf{0.2}$, $z_x = -1.7$

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
15	12	344.33	-0.49	-175	2	1	3	0.5741
16	11	315.33	-0.47	-167	10	2	13	0.8693
19	4	108.33	-0.46	-165	12	3	14	0.7120
20	2	49.33	-0.45	-163	15	4	16	0.5864
20	3	79.33	-0.44	-158	20	5	19	0.5249
20	5	139.33	-0.41	-148	29	6	23	0.5209
22	1	21.33	-0.40	-143	34	7	25	0.4279
18	11	317.33	-0.40	-143	34	8	27	0.3464
11	12	340.33	0.38	137	46	9	34	0.4737
23	1	22.33	-0.36	-131	46	10	35	0.3612
11	11	310.33	0.37	132	51	11	39	0.3668
11	10	280.33	0.35	127	56	12	43	0.3715
21	9	260.33	-0.32	-116	61	13	46	0.3434
24	2	53.33	-0.32	-114	63	14	48	0.2880
22	10	291.33	-0.28	-99	78	15	55	0.3824
12	1	11.33	0.26	95	88	16	62	0.4728
10	6	159.33	0.26	95	88	17	63	0.3877
27	2	56.33	-0.22	-77	100	18	72	0.5265
26	5	145.33	-0.21	-75	102	19	74	0.4720
7	10	276.33	0.22	78	105	20	75	0.3938
9	3	68.33	0.19	68	114	21	79	0.3955
7	7	186.33	0.18	64	119	22	80	0.3245
27	8	236.33	-0.13	-48	129	23	87	0.3985
7	2	36.33	0.11	39	143	24	93	0.4470
3	12	332.33	0.11	39	143	25	94	0.3780
6	4	95.33	0.10	37	146	26	97	0.3574

Wedjat: $n_G = 4$, $N_G = 177$, $q_B = 0.0226$

$P = 2.85$, $\Theta_R = -8$

Weak periodicity: $z = 2.1$, $Q_z = 0.1$, $z_x = \mathbf{2.0}$

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
1	5	120.33	0.04	13	21	1	29	0.4846
6	9	245.33	-0.11	-38	30	2	43	0.2537
30	10	299.33	-0.16	-57	49	3	73	0.2285
3	2	32.33	0.16	57	65	4	84	0.1228

$P = 29.60$, $\Theta_R = 6$

Periodicity: $z = 2.9$, $Q_z = 0.05$, $z_x = \mathbf{2.9}$

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
30	10	299.33	-0.01	-2	8	1	12	0.2399
3	2	32.33	-0.03	-9	15	2	20	0.0742
1	5	120.33	-0.05	-19	25	3	36	0.0474
6	9	245.33	0.17	61	55	4	72	0.0804

Wedjat: $n_S = 1$, $N_S = 105$, $q_B = 0.0095$

$P = 2.85$, $\Theta_R = -101$

No periodicity

D	M	s_i	ϕ_i	Θ_i
10	6	159.33	-0.28	-101

$P = 29.60$, $\Theta_R = 95$

No periodicity

D	M	s_i	ϕ_i	Θ_i
10	6	159.33	0.26	95

Son: $n_G = 6$, $N_G = 177$, $q_B = 0.0339$

$P = 2.85$, $\Theta_R = 18$

Weak periodicity: $z = 2.3$, $Q_z = 0.1$, $z_x = \mathbf{2.0}$

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
24	3	83.33	0.05	19	1	1	2	0.0666
1	5	120.33	0.04	13	6	2	6	0.0157
21	3	80.33	0.00	0	18	3	27	0.0622
1	9	240.33	0.14	51	32	4	47	0.0745
13	12	342.33	-0.07	-25	44	5	62	0.0590
28	3	87.33	0.46	164	146	6	151	0.4052

$P = 29.60$, $\Theta_R = -82$

No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
28	3	87.33	-0.17	-60	21	1	22	0.5317
24	3	83.33	-0.30	-109	27	2	27	0.2325
1	5	120.33	-0.05	-19	63	3	59	0.3233
21	3	80.33	-0.40	-146	64	4	61	0.1523
1	9	240.33	0.00	0	82	5	84	0.1566
13	12	342.33	0.45	161	117	6	122	0.2340

Son: $n_S = 4$, $N_S = 105$, $q_B = 0.0381$

$P = 2.85$, $\Theta_R = 85$

No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
17	8	226.33	0.23	82	3	1	3	0.1100
12	2	41.33	0.32	114	29	2	23	0.2179
20	2	49.33	0.12	44	40	3	29	0.0970
26	1	25.33	-0.30	-107	168	4	95	0.4914

$P = 29.60$, $\Theta_R = -167$

No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
17	8	226.33	-0.47	-170	2	1	5	0.1765
20	2	49.33	-0.45	-163	5	2	7	0.0268
26	1	25.33	-0.26	-95	73	3	53	0.3285
12	2	41.33	0.28	100	92	4	66	0.2434

Sakhmet: $n_G = \mathbf{3}$, $N_G = 177$, $q_B = 0.0169$

$P = 2.85$, $\Theta_R = -33$

Weak periodicity: $z = 2.2$, $Q_z = \mathbf{0.1}$, $z_x = \mathbf{1.6}$

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
29	5	148.33	-0.14	-51	18	1	25	0.3478
9	5	128.33	-0.16	-57	24	2	33	0.1075
1	5	120.33	0.04	13	45	3	56	0.0696

$P = 29.60$, $\Theta_R = 1$

No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
1	5	120.33	-0.05	-19	20	1	29	0.3909
29	5	148.33	-0.11	-39	39	2	56	0.2454
9	5	128.33	0.22	78	77	3	97	0.2273

Sakhmet: $n_S = \mathbf{3}$, $N_S = \mathbf{105}$, $q_B = 0.0286$

$P = 2.85$, $\Theta_R = -86$

Periodicity: $z = 3.0$, $Q_z = \mathbf{0.05}$, $z_x = 0.0$

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
13	6	162.33	-0.23	**-82**	4	1	3	0.0833
7	10	276.33	-0.23	**-82**	4	2	4	0.0047
27	8	236.33	-0.26	**-95**	8	**3**	**6**	**0.0004**

$P = 29.60$, $\Theta_R = 78$

No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
7	10	276.33	0.22	78	0	1	1	0.0286
13	6	162.33	0.37	132	54	2	32	0.2323
27	8	236.33	-0.13	-48	126	3	70	0.3233

Followers: $n_G = \mathbf{15}$, $N_G = 177$, $q_B = 0.0847$

$P = 2.85$, $\Theta_R = 22$
Weak periodicity: $z = 1.6$, $Q_z = \mathbf{0.2}$, $z_x = \mathbf{1.4}$

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
21	5	140.33	0.05	19	3	1	3	0.2333
1	5	120.33	0.04	13	9	2	12	0.2705
29	11	328.33	0.02	6	15	3	25	0.3567
8	10	277.33	0.12	44	23	4	35	0.3447
1	9	240.33	0.14	51	29	5	41	0.2651
3	2	32.33	0.16	57	35	6	50	0.2472
21	1	20.33	-0.05	-19	40	7	53	0.1591
6	9	245.33	-0.11	-38	59	8	77	0.3277
16	8	225.33	-0.12	-44	66	9	81	0.2468
13	10	282.33	-0.12	-44	66	10	82	0.1551
19	1	18.33	0.25	88	67	11	84	0.0976
3	10	272.33	0.37	133	111	12	123	0.3491
9	10	278.33	0.47	171	149	13	154	0.5476
10	2	39.33	-0.39	-139	160	14	160	0.4909
1	4	90.33	-0.49	-177	162	15	163	0.4088

$P = 29.60$, $\Theta_R = 57$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
6	9	245.33	0.17	61	4	1	5	0.3577
10	2	39.33	0.21	76	18	2	20	0.5148
3	10	272.33	0.08	30	28	3	30	0.4731
8	10	277.33	0.25	90	33	4	38	0.4041
9	10	278.33	0.28	103	45	5	48	0.3849
1	9	240.33	0.00	0	57	6	62	0.4305
3	2	32.33	-0.03	-9	67	7	73	0.4249
29	11	328.33	-0.03	-9	67	8	75	0.3020
1	5	120.33	-0.05	-19	76	9	86	0.3047
1	4	90.33	-0.07	-24	81	10	91	0.2413
13	10	282.33	0.42	151	94	11	106	0.2865
16	8	225.33	0.49	178	121	12	131	0.4333
19	1	18.33	-0.50	-180	123	13	134	0.3475
21	1	20.33	-0.43	-155	147	14	156	0.4522
21	5	140.33	-0.38	-136	167	15	171	0.4838

Followers: $n_S = \mathbf{6}$, $N_S = \mathbf{105}$, $q_B = 0.0571$

$P = 2.85$, $\Theta_R = 82$
Periodicity: $z = 4.3$, $Q_z = \mathbf{0.01}$, $z_x = 0.1$

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
17	8	226.33	0.23	82	0	1	3	0.1618
11	12	340.33	0.23	82	0	2	4	0.0181
7	7	186.33	0.19	69	13	3	11	0.0218
11	10	280.33	0.18	63	19	4	15	0.0087
21	9	260.33	0.16	57	25	**5**	**18**	**0.0028**
11	1	10.33	0.44	158	76	6	42	0.0311

$P = 29.60$, $\Theta_R = 134$
Weak periodicity: $z = 1.7$, $Q_z = 0.2$, $z_x = -0.8$

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
11	12	340.33	0.38	137	3	1	3	0.1618
11	10	280.33	0.35	127	7	2	7	0.0566
11	1	10.33	0.23	83	50	3	31	0.2598
17	8	226.33	-0.47	-170	57	4	37	0.1590
7	7	186.33	0.18	64	70	5	48	0.1378
21	9	260.33	-0.32	-116	110	6	74	0.2477

Ennead: $n_G = 18$, $N_G = \mathbf{177}$, $q_B = 0.1017$

$P = 2.85$, $\Theta_R = 46$
Weak periodicity: $z = 2.2$, $Q_z = 0.1$, $z_x = \mathbf{1.1}$

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
10	3	69.33	0.14	51	4	1	3	0.2751
24	5	143.33	0.11	38	9	2	9	0.2310
18	9	257.33	0.11	38	9	3	10	0.0731
17	2	46.33	0.07	25	21	4	24	0.2231
8	8	217.33	0.07	25	21	5	27	0.1334
6	2	35.33	0.21	76	29	6	36	0.1539
30	5	149.33	0.21	76	29	7	37	0.0764
14	2	43.33	0.02	6	40	8	44	0.0735
19	1	18.33	0.25	88	42	9	48	0.0506
9	2	38.33	0.26	95	48	10	57	0.0601
16	12	345.33	-0.02	-6	53	11	62	0.0468
2	1	1.33	0.28	101	55	**12**	**63**	**0.0237**
5	4	94.33	-0.09	-32	78	13	91	0.1317
1	2	30.33	0.46	164	118	14	126	0.4052
1	4	90.33	-0.49	-177	137	15	143	0.4899
16	2	45.33	-0.28	-101	147	16	154	0.5029
13	4	102.33	-0.28	-101	147	17	155	0.4091
30	4	119.33	-0.32	-114	160	18	166	0.4238

$P = 29.60$, $\Theta_R = 64$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
9	2	38.33	0.18	64	0	1	1	0.1017
10	3	69.33	0.22	81	17	2	19	0.5893
8	8	217.33	0.22	81	17	3	20	0.3327
6	2	35.33	0.08	27	37	4	39	0.5701
5	4	94.33	0.07	25	39	5	42	0.4267
13	4	102.33	0.34	122	58	6	60	0.5799
14	2	43.33	0.35	124	61	7	63	0.4622
16	2	45.33	0.41	149	85	8	91	0.7184
1	4	90.33	-0.07	-24	88	9	96	0.6511
2	1	1.33	-0.07	-26	90	10	99	0.5577
30	5	149.33	-0.07	-26	90	11	100	0.4392
30	4	119.33	-0.09	-31	95	12	105	0.3801
17	2	46.33	0.45	161	97	13	106	0.2802
1	2	30.33	-0.09	-34	97	14	108	0.2069
19	1	18.33	-0.50	-180	117	15	126	0.2993
16	12	345.33	-0.45	-163	134	16	144	0.3934
18	9	257.33	-0.42	-153	143	17	150	0.3564
24	5	143.33	-0.28	-99	163	18	165	0.4135

Ennead: $n_S = 3$, $N_S = 105$, $q_B = 0.0286$

$P = 2.85$, $\Theta_R = -117$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
15	12	344.33	-0.37	-133	16	1	16	0.3711
7	2	36.33	-0.44	-158	41	2	32	0.2323
19	10	288.33	-0.02	-6	110	3	66	0.2920

$P = 29.60$, $\Theta_R = -171$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
15	12	344.33	-0.49	-175	4	1	7	0.1837
19	10	288.33	-0.38	-136	35	2	29	0.2006
7	2	36.33	0.11	39	150	3	98	0.5333

Heliopolis: $n_G = 4$, $N_G = 177$, $q_B = 0.0226$

$P = 2.85$, $\Theta_R = -70$

Weak periodicity: $z = 2.1$, $Q_z = 0.1$, $z_x = \mathbf{0.2}$

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
26	3	85.33	-0.25	-88	18	1	14	0.2739
9	7	188.33	-0.11	-38	32	2	34	0.1789
19	8	228.33	-0.07	-25	45	3	47	0.0900
10	2	39.33	-0.39	-139	69	4	69	0.0711

$P = 29.60$, $\Theta_R = 138$

No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
9	7	188.33	0.24	88	50	1	44	0.6342
10	2	39.33	0.21	76	62	2	53	0.3374
19	8	228.33	-0.40	-146	76	3	67	0.1933
26	3	85.33	-0.24	-85	137	4	121	0.2928

Heliopolis: $n_S = 4$, $N_S = 105$, $q_B = 0.0381$

$P = 2.85$, $\Theta_R = -168$

Weak periodicity: $z = 2.3$, $Q_z = 0.1$, $z_x = -2.2$

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
22	11	321.33	-0.44	-158	10	1	8	0.2671
16	11	315.33	0.46	164	27	2	18	0.1487
3	12	332.33	0.42	152	40	3	27	0.0820
10	6	159.33	-0.28	-101	67	4	45	0.0915

$P = 29.60$, $\Theta_R = 132$

No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
10	6	159.33	0.26	95	37	1	22	0.5745
16	11	315.33	-0.47	-167	61	2	41	0.4662
3	12	332.33	0.11	39	93	3	64	0.4424
22	11	321.33	-0.26	-95	134	4	85	0.4070

Enemy: $n_G = 6$, $N_G = 177$, $q_B = 0.0339$

$P = 2.85$, $\Theta_R = 140$

Weak periodicity: $z = 1.7$, $Q_z = 0.2$, $z_x = \mathbf{-1.0}$

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
23	10	292.33	0.39	139	1	1	2	0.0666
9	4	98.33	0.32	114	27	2	19	0.1345
9	2	38.33	0.26	95	46	3	36	0.1219
19	1	18.33	0.25	88	52	4	42	0.0533
1	8	210.33	-0.39	-139	81	5	66	0.0732
13	2	42.33	-0.33	-120	100	6	77	0.0467

$P = 29.60$, $\Theta_R = 77$

No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
9	4	98.33	0.20	73	3	1	4	0.1289
9	2	38.33	0.18	64	13	2	16	0.1007
13	2	42.33	0.31	112	35	3	36	0.1219
1	8	210.33	-0.01	-5	81	4	81	0.2950
19	1	18.33	-0.50	-180	104	5	111	0.3241
23	10	292.33	-0.24	-87	164	6	164	0.4829

Enemy: $n_S = 5$, $N_S = 105$, $q_B = 0.0476$

$P = 2.85$, $\Theta_R = -121$

No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
23	1	22.33	-0.35	-126	5	1	2	0.0930
26	1	25.33	-0.30	-107	14	2	10	0.0791
14	3	73.33	-0.46	-164	43	3	32	0.1941
25	8	234.33	0.04	13	134	4	82	0.5521
13	3	72.33	0.19	69	170	5	96	0.4840

$P = 29.60$, $\Theta_R = -146$

No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
23	1	22.33	-0.36	-131	15	1	12	0.4432
26	1	25.33	-0.26	-95	51	2	40	0.5739
25	8	234.33	-0.20	-73	73	3	55	0.4901
14	3	73.33	0.36	129	85	4	61	0.3309
13	3	72.33	0.33	117	97	5	68	0.2228

Earth: $n_G = \mathbf{19}$, $N_G = 177$, $q_B = 0.1073$

$P = 2.85$, $\Theta_R = -61$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
2	4	91.33	-0.14	-51	10	1	9	0.6401
29	5	148.33	-0.14	-51	10	2	10	0.2924
26	3	85.33	-0.25	-88	28	3	25	0.5119
2	6	151.33	-0.09	-32	29	4	30	0.4046
6	3	65.33	-0.26	-95	34	5	34	0.2989
1	1	0.33	-0.07	-25	36	6	38	0.2186
1	10	270.33	-0.33	-120	59	7	67	0.5884
30	2	59.33	-0.37	-133	72	8	76	0.5780
21	5	140.33	0.05	19	80	9	86	0.5835
12	12	341.33	-0.42	-152	91	10	95	0.5750
1	7	180.33	0.09	32	92	11	99	0.4993
1	6	150.33	-0.44	-158	97	12	104	0.4413
27	3	86.33	0.11	38	99	13	108	0.3748
24	5	143.33	0.11	38	99	14	109	0.2794
28	5	147.33	-0.49	-177	116	15	125	0.3645
1	11	300.33	0.19	69	130	16	137	0.4000
28	3	87.33	0.46	164	135	17	140	0.3330
7	9	246.33	0.25	88	149	18	153	0.3774
3	10	272.33	0.37	133	167	19	170	0.4623

$P = 29.60$, $\Theta_R = -27$
Periodicity: $z = 6.6$, $Q_z = \mathbf{0.001}$, $z_x = \mathbf{5.3}$

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
1	1	0.33	-0.11	-39	12	1	17	0.8549
29	5	148.33	-0.11	-39	12	2	18	0.5902
1	6	150.33	-0.04	-14	13	3	19	0.3344
30	2	59.33	-0.11	-41	14	4	21	0.1824
2	4	91.33	-0.03	-12	15	5	23	0.0930
1	7	180.33	-0.03	-9	17	6	26	0.0535
28	5	147.33	-0.14	-51	24	7	37	0.0957
2	6	151.33	-0.01	-2	25	8	38	0.0457
1	10	270.33	0.01	5	32	9	47	0.0599
28	3	87.33	-0.17	-60	34	10	48	0.0292
1	11	300.33	0.03	10	37	11	54	0.0266
27	3	86.33	-0.20	-73	46	12	63	0.0343
3	10	272.33	0.08	30	56	13	74	0.0506
26	3	85.33	-0.24	-85	58	14	75	0.0275
6	3	65.33	0.09	32	59	15	76	0.0143
24	5	143.33	-0.28	-99	73	16	88	0.0244
7	9	246.33	0.20	73	100	17	115	0.1084
21	5	140.33	-0.38	-136	109	18	122	0.1023
12	12	341.33	0.41	149	176	19	174	0.5045

Earth: $n_S = \mathbf{5}$, $N_S = 105$, $q_B = 0.0476$

$P = 2.85$, $\Theta_R = -75$
Weak periodicity: $z = 2.9$, $Q_z = \mathbf{0.06}$, $z_x = 0.2$

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
26	5	145.33	-0.19	-69	5	1	4	0.1773
27	12	356.33	-0.16	-57	18	2	12	0.1091
20	5	139.33	-0.30	-107	33	3	23	0.0941
17	5	136.33	-0.35	-126	52	4	33	0.0702
19	10	288.33	-0.02	-6	68	5	42	0.0483

$P = 29.60$, $\Theta_R = -119$
Weak periodicity: $z = 1.8$, $Q_z = \mathbf{0.2}$, $z_x = -0.4$

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
19	10	288.33	-0.38	-136	17	1	12	0.4432
20	5	139.33	-0.41	-148	29	2	23	0.3000
26	5	145.33	-0.21	-75	44	3	33	0.2065
17	5	136.33	0.49	175	66	4	49	0.2040
27	12	356.33	-0.08	-29	90	5	62	0.1725

Heaven: $n_G = \mathbf{19}$, $N_G = \mathbf{177}$, $q_B = 0.1073$

$P = 2.85$, $\Theta_R = 10$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
2	12	331.33	0.07	25	15	1	22	0.9178
1	3	60.33	-0.02	-6	16	2	23	0.7236
1	7	180.33	0.09	32	22	3	29	0.6153
24	5	143.33	0.11	38	28	4	41	0.6547
19	8	228.33	-0.07	-25	35	5	53	0.6854
10	3	69.33	0.14	51	41	6	56	0.5654
1	11	300.33	0.19	69	59	7	78	0.7449
2	4	91.33	-0.14	-51	61	8	80	0.6372
6	2	35.33	0.21	76	66	9	83	0.5393
19	1	18.33	0.25	88	78	10	92	0.5328
2	2	31.33	-0.19	-69	79	11	97	0.4713
26	3	85.33	-0.25	-88	98	12	115	0.5857
5	1	4.33	0.33	120	110	13	125	0.5907
13	4	102.33	-0.28	-101	111	14	128	0.5123
1	12	330.33	-0.28	-101	111	15	130	0.4244
3	10	272.33	0.37	133	123	16	132	0.3425
1	8	210.33	-0.39	-139	149	17	153	0.4783
1	6	150.33	-0.44	-158	168	18	166	0.5188
15	8	224.33	-0.47	-171	179	19	175	0.5150

$P = 29.60$, $\Theta_R = 0$
Periodicity: $z = 3.4$, $Q_z = \mathbf{0.03}$, $z_x = \mathbf{3.4}$

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
1	8	210.33	-0.01	-5	4	1	7	0.5484
1	7	180.33	-0.03	-9	9	2	16	0.5247
5	1	4.33	0.03	10	10	3	18	0.3036
1	11	300.33	0.03	10	10	4	19	0.1396
2	4	91.33	-0.03	-12	12	5	20	0.0559
1	6	150.33	-0.04	-14	14	6	23	0.0309
1	12	330.33	0.04	15	15	7	25	0.0138
2	2	31.33	-0.06	-22	22	8	31	0.0144
6	2	35.33	0.08	27	27	9	41	0.0275
2	12	331.33	0.08	27	27	10	42	0.0118
1	3	60.33	-0.08	-29	29	11	43	0.0048
3	10	272.33	0.08	30	30	**12**	**45**	**0.0022**
10	3	69.33	0.22	81	81	13	99	0.2628
26	3	85.33	-0.24	-85	85	14	104	0.2238
24	5	143.33	-0.28	-99	99	15	117	0.2724
13	4	102.33	0.34	122	122	16	136	0.3884
19	8	228.33	-0.40	-146	146	17	150	0.4446
15	8	224.33	0.46	166	166	18	167	0.5294
19	1	18.33	-0.50	-180	180	19	175	0.5150

Heaven: $n_S = \mathbf{4}$, $N_S = 105$, $q_B = 0.0381$

$P = 2.85$, $\Theta_R = 103$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
22	1	21.33	0.30	107	5	1	2	0.0747
20	6	169.33	0.23	82	20	2	13	0.0857
19	5	138.33	0.35	126	24	3	16	0.0213
26	5	145.33	-0.19	-69	172	4	99	0.5237

$P = 29.60$, $\Theta_R = -132$
Weak periodicity: $z = 2.9$, $Q_z = \mathbf{0.06}$, $z_x = -1.3$

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
22	1	21.33	-0.40	-143	11	1	7	0.2381
20	6	169.33	-0.40	-143	11	2	8	0.0349
19	5	138.33	-0.44	-160	28	3	20	0.0388
26	5	145.33	-0.21	-75	57	4	48	0.1096

Busiris: $n_G = \mathbf{4}$, $N_G = 177$, $q_B = 0.0226$

$P = 2.85$, $\Theta_R = 19$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
2	8	211.33	-0.04	-13	32	1	43	0.6258
28	10	297.33	0.14	51	32	2	48	0.2957
6	7	185.33	-0.16	-57	76	3	93	0.3511
30	7	209.33	0.26	95	76	4	97	0.1773

$P = 29.60$, $\Theta_R = 3$
Periodicity: $z = 3.0$, $Q_z = \mathbf{0.05}$, $z_x = \mathbf{3.0}$

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
2	8	211.33	0.02	8	5	1	6	0.1282
30	7	209.33	-0.05	-17	20	2	29	0.1391
28	10	297.33	-0.07	-26	29	3	45	0.0813
6	7	185.33	0.14	51	48	4	63	0.0543

Busiris: $n_S = 3$, $N_S = 105$, $q_B = 0.0286$

$P = 2.85$, $\Theta_R = -123$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
14	5	133.33	-0.40	-145	22	1	19	0.4235
26	5	145.33	-0.19	-69	53	2	39	0.3068
26	2	55.33	0.23	82	155	3	87	0.4543

$P = 29.60$, $\Theta_R = -111$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
26	2	55.33	-0.25	-90	21	1	16	0.3711
26	5	145.33	-0.21	-75	35	2	27	0.1798
14	5	133.33	0.39	139	110	3	68	0.3076

Rebel: $n_G = 3$, $N_G = 177$, $q_B = 0.0169$

$P = 2.85$, $\Theta_R = 125$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
2	1	1.33	0.28	101	24	1	16	0.2393
7	9	246.33	0.25	88	36	2	30	0.0915
1	8	210.33	-0.39	-139	96	3	87	0.1837

$P = 29.60$, $\Theta_R = 11$
Weak periodicity: $z = 1.6$, $Q_z = 0.2$, $z_x = \mathbf{1.6}$

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
1	8	210.33	-0.01	-5	16	1	20	0.2896
2	1	1.33	-0.07	-26	38	2	49	0.2017
7	9	246.33	0.20	73	62	3	81	0.1587

Rebel: $n_S = 3$, $N_S = 105$, $q_B = 0.0286$

$P = 2.85$, $\Theta_R = 107$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
12	2	41.33	0.32	114	7	1	5	0.1349
23	12	352.33	0.44	158	51	2	38	0.2962
20	2	49.33	0.12	44	63	3	42	0.1180

$P = 29.60$, $\Theta_R = -162$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
20	2	49.33	-0.45	-163	0	1	1	0.0286
23	12	352.33	-0.22	-77	85	2	63	0.5406
12	2	41.33	0.28	100	98	3	69	0.3155

Thoth: $n_G = 10$, $N_G = 177$, $q_B = 0.0565$

$P = 2.85$, $\Theta_R = 115$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
9	4	98.33	0.32	114	1	1	1	0.0565
13	7	192.33	0.30	107	8	2	6	0.0411
26	4	115.33	0.28	101	14	3	9	0.0117
19	9	258.33	0.46	164	49	4	41	0.1998
3	2	32.33	0.16	57	58	5	45	0.1087
1	4	90.33	-0.49	-177	68	6	56	0.0953
28	5	147.33	-0.49	-177	68	7	57	0.0409
27	3	86.33	0.11	38	77	8	65	0.0297
29	5	148.33	-0.14	-51	166	9	165	0.5908
30	10	299.33	-0.16	-57	172	10	173	0.5164

$P = 29.60$, $\Theta_R = -39$
Weak periodicity: $z = 2.1$, $Q_z = 0.1$, $z_x = \mathbf{1.3}$

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
29	5	148.33	-0.11	-39	1	1	2	0.1098
28	5	147.33	-0.14	-51	11	2	15	0.2066
1	4	90.33	-0.07	-24	15	3	21	0.1124
3	2	32.33	-0.03	-9	30	4	39	0.1766
27	3	86.33	-0.20	-73	33	5	46	0.1166
30	10	299.33	-0.01	-2	37	6	52	0.0720
26	4	115.33	-0.22	-80	41	7	54	0.0317
19	9	258.33	-0.39	-141	101	8	110	0.2827
9	4	98.33	0.20	73	113	9	120	0.2381
13	7	192.33	0.38	137	176	10	176	0.5384

Thoth: $n_S = 2$, $N_S = 105$, $q_B = 0.0190$

$P = 2.85$, $\Theta_R = 66$
Weak periodicity: $z = 1.7$, $Q_z = 0.2$, $z_x = 0.3$

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
20	2	49.33	0.12	44	22	1	18	0.2926
10	7	189.33	0.25	88	22	2	19	0.0501

$P = 29.60$, $\Theta_R = 149$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
20	2	49.33	-0.45	-163	49	1	34	0.4800
10	7	189.33	0.28	100	49	2	35	0.1432

Onnophris: $n_G = 7$, $N_G = 177$, $q_B = 0.0395$

$P = 2.85$, $\Theta_R = -138$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
28	7	207.33	-0.44	-158	20	1	14	0.4316
16	2	45.33	-0.28	-101	37	2	24	0.2451
1	12	330.33	-0.28	-101	37	3	27	0.0894
28	3	87.33	0.46	164	58	4	47	0.1144
29	8	238.33	0.44	158	64	5	54	0.0619
28	6	177.33	0.04	13	151	6	141	0.4861
24	3	83.33	0.05	19	157	7	146	0.3567

$P = 29.60$, $\Theta_R = -47$
Weak periodicity: $z = 2.1$, $Q_z = 0.1$, $z_x = \mathbf{1.0}$

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
28	6	177.33	-0.13	-46	1	1	2	0.0775
28	7	207.33	-0.11	-41	6	2	7	0.0288
28	3	87.33	-0.17	-60	14	3	16	0.0235
29	8	238.33	-0.07	-24	23	4	29	0.0264
1	12	330.33	0.04	15	62	5	78	0.1959
24	3	83.33	-0.30	-109	62	6	79	0.0928
16	2	45.33	0.41	149	164	7	167	0.4918

Onnophris: $n_S = 3$, $N_S = 105$, $q_B = 0.0286$

$P = 2.85$, $\Theta_R = -32$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
23	11	322.33	-0.09	-32	1	1	1	0.0286
24	8	233.33	-0.32	-114	82	2	39	0.3068
13	3	72.33	0.19	69	102	3	55	0.2077

$P = 29.60$, $\Theta_R = -102$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
24	8	233.33	-0.24	-85	17	1	13	0.3140
23	11	322.33	-0.23	-82	20	2	15	0.0670
13	3	72.33	0.33	117	141	3	82	0.4166

Nut: $n_G = 3$, $N_G = 177$, $q_B = 0.0169$

$P = 2.85$, $\Theta_R = 55$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
22	12	351.33	0.09	32	24	1	28	0.3804
18	7	197.33	0.05	19	37	2	44	0.1711
28	1	27.33	0.40	145	90	3	100	0.2407

$P = 29.60$, $\Theta_R = -105$
Weak periodicity: $z = 1.8$, $Q_z = 0.2$, $z_x = \mathbf{-0.1}$

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
22	12	351.33	-0.25	-90	16	1	13	0.1993
28	1	27.33	-0.19	-70	35	2	26	0.0714
18	7	197.33	-0.45	-163	57	3	45	0.0408

Nut: $n_S = 4$, $N_S = 105$, $q_B = 0.0381$

$P = 2.85$, $\Theta_R = 81$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
17	8	226.33	0.23	82	1	1	3	0.1100
12	2	41.33	0.32	114	33	2	24	0.2321
20	2	49.33	0.12	44	37	3	27	0.0820
4	10	273.33	-0.28	-101	178	4	105	0.5703

$P = 29.60$, $\Theta_R = 139$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
12	2	41.33	0.28	100	39	1	24	0.6063
17	8	226.33	-0.47	-170	51	2	34	0.3735
20	2	49.33	-0.45	-163	58	3	41	0.2046
4	10	273.33	0.12	42	98	4	66	0.2434

Heart: $n_G = 27$, $N_G = 177$, $q_B = 0.1525$

$P = 2.85$, $\Theta_R = -91$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
9	1	8.33	-0.26	-95	4	1	4	0.4842
6	3	65.33	-0.26	-95	4	2	5	0.1695
16	2	45.33	-0.28	-101	10	3	11	0.2289
13	4	102.33	-0.28	-101	10	4	12	0.0969
7	8	216.33	-0.28	-101	10	5	13	0.0365
29	3	88.33	-0.19	-69	22	6	19	0.0576
30	4	119.33	-0.32	-114	23	7	22	0.0399
13	2	42.33	-0.33	-120	29	8	24	0.0218
9	5	128.33	-0.16	-57	34	9	29	0.0247
29	5	148.33	-0.14	-51	41	10	34	0.0267
10	2	39.33	-0.39	-139	48	11	41	0.0396
4	6	153.33	-0.39	-139	48	12	42	0.0201
12	12	341.33	-0.42	-152	60	13	54	0.0594
4	4	93.33	-0.44	-158	67	14	61	0.0729
16	12	345.33	-0.02	-6	85	15	83	0.2791
24	1	23.33	0.00	0	91	16	87	0.2470
9	11	308.33	0.00	0	91	17	90	0.2048
9	10	278.33	0.47	171	98	18	99	0.2457
28	3	87.33	0.46	164	105	19	105	0.2447
24	3	83.33	0.05	19	110	20	109	0.2182
14	4	103.33	0.07	25	116	21	115	0.2178
25	10	294.33	0.09	32	123	22	126	0.2795
25	3	84.33	0.40	145	124	23	129	0.2401
25	12	354.33	0.14	51	142	24	147	0.3929
2	1	1.33	0.28	101	168	25	164	0.5347
9	2	38.33	0.26	95	174	26	170	0.5269
7	9	246.33	0.25	88	180	27	176	0.5193

$P = 29.60$, $\Theta_R = 47$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
9	1	8.33	0.16	59	11	1	8	0.7340
6	3	65.33	0.09	32	15	2	14	0.6531
9	2	38.33	0.18	64	16	3	16	0.4502
7	8	216.33	0.19	68	21	4	22	0.4383
4	6	153.33	0.06	22	25	5	27	0.3959
7	9	246.33	0.20	73	26	6	30	0.3034
10	2	39.33	0.21	76	29	7	31	0.1841
9	5	128.33	0.22	78	31	8	34	0.1361
4	4	93.33	0.03	13	35	9	38	0.1145
9	10	278.33	0.28	103	55	10	64	0.5202
9	11	308.33	0.30	107	60	11	71	0.5281
13	2	42.33	0.31	112	65	12	76	0.4969
2	1	1.33	-0.07	-26	74	13	86	0.5601
13	4	102.33	0.34	122	75	14	89	0.4952
30	4	119.33	-0.09	-31	79	15	95	0.4857
29	5	148.33	-0.11	-39	86	16	101	0.4769
14	4	103.33	0.37	134	87	17	102	0.3864
29	3	88.33	-0.13	-48	96	18	110	0.4127
25	12	354.33	-0.15	-53	100	19	113	0.3605
16	2	45.33	0.41	149	101	20	114	0.2842
12	12	341.33	0.41	149	101	21	115	0.2178
28	3	87.33	-0.17	-60	108	22	120	0.2056
25	10	294.33	-0.17	-63	110	23	122	0.1631
25	3	84.33	-0.27	-97	144	24	154	0.4888
16	12	345.33	-0.45	-163	150	25	160	0.4816
24	3	83.33	-0.30	-109	156	26	164	0.4484
24	1	23.33	-0.33	-119	166	27	169	0.4293

Heart: $n_S = \mathbf{5}$, $N_S = \mathbf{105}$, $q_B = 0.0476$

$P = 2.85$, $\Theta_R = -172$
Periodicity: $z = 3.2$, $Q_z = \mathbf{0.04}$, $z_x = \mathbf{-3.1}$

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
14	3	73.33	-0.46	-164	8	1	5	0.2165
22	7	201.33	0.46	164	24	2	14	0.1414
5	11	304.33	-0.40	-145	26	3	18	0.0516
23	1	22.33	-0.35	-126	45	4	28	0.0423
10	11	309.33	0.35	126	62	**5**	**39**	**0.0367**

$P = 29.60$, $\Theta_R = 154$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
14	3	73.33	0.36	129	24	1	15	0.5190
10	11	309.33	0.33	120	34	2	22	0.2821
23	1	22.33	-0.36	-131	75	3	54	0.4779
22	7	201.33	-0.32	-114	92	4	65	0.3746
5	11	304.33	0.16	59	95	5	66	0.2055

Nun: $n_G = 7$, $N_G = 177$, $q_B = 0.0395$

$P = 2.85$, $\Theta_R = -38$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
1	1	0.33	-0.07	-25	13	1	14	0.4316
12	7	191.33	-0.05	-19	19	2	25	0.2599
19	2	48.33	-0.23	-82	44	3	55	0.3715
17	2	46.33	0.07	25	63	4	73	0.3269
30	2	59.33	-0.37	-133	95	5	111	0.4484
30	5	149.33	0.21	76	114	6	121	0.3456
1	4	90.33	-0.49	-177	139	7	148	0.3696

$P = 29.60$, $\Theta_R = -52$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
30	2	59.33	-0.11	-41	11	1	10	0.3320
1	1	0.33	-0.11	-39	13	2	14	0.1039
30	5	149.33	-0.07	-26	25	3	30	0.1140
1	4	90.33	-0.07	-24	28	4	32	0.0364
19	2	48.33	-0.49	-175	123	5	127	0.5671
17	2	46.33	0.45	161	147	6	151	0.5529
12	7	191.33	0.35	124	176	7	175	0.5412

Nun: $n_S = \mathbf{3}$, $N_S = \mathbf{105}$, $q_B = 0.0286$

$P = 2.85$, $\Theta_R = -122$
Weak periodicity: $z = 2.9$, $Q_z = \mathbf{0.06}$, $z_x = -0.8$

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
17	5	136.33	-0.35	-126	4	1	4	0.1095
15	12	344.33	-0.37	-133	10	2	9	0.0257
23	3	82.33	-0.30	-107	15	**3**	**11**	**0.0032**

$P = 29.60$, $\Theta_R = -161$
Weak periodicity: $z = 2.4$, $Q_z = 0.1$, $z_x = -2.1$

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
15	12	344.33	-0.49	-175	14	1	15	0.3526
17	5	136.33	0.49	175	24	2	22	0.1295
23	3	82.33	-0.34	-121	40	3	33	0.0674

Seth: $n_G = 5$, $N_G = 177$, $q_B = 0.0282$

$P = 2.85$, $\Theta_R = 11$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
27	1	26.33	0.05	19	8	1	9	0.2273
27	3	86.33	0.11	38	27	2	40	0.3126
13	12	342.33	-0.07	-25	36	3	55	0.2031
29	3	88.33	-0.19	-69	80	4	98	0.3003
9	4	98.33	0.32	114	103	5	118	0.2417

$P = 29.60$, $\Theta_R = -73$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
27	3	86.33	-0.20	-73	0	1	1	0.0282
27	1	26.33	-0.23	-82	10	2	9	0.0252
29	3	88.33	-0.13	-48	24	3	24	0.0293
13	12	342.33	0.45	161	126	4	128	0.4900
9	4	98.33	0.20	73	146	5	146	0.3958

Seth: $n_S = \mathbf{9}$, $N_S = 105$, $q_B = 0.0857$

$P = 2.85$, $\Theta_R = 57$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
13	3	72.33	0.19	69	12	1	8	0.5117
20	2	49.33	0.12	44	13	2	12	0.2750
17	8	226.33	0.23	82	25	3	18	0.1964
11	12	340.33	0.23	82	25	4	19	0.0739
12	2	41.33	0.32	114	56	5	29	0.0977
18	3	77.33	-0.05	-19	76	6	43	0.1593
26	1	25.33	-0.30	-107	165	7	92	0.6831
17	7	196.33	-0.30	-107	165	8	95	0.5739
24	8	233.33	-0.32	-114	171	9	100	0.4902

$P = 29.60$, $\Theta_R = -180$
Periodicity: $z = 3.1$, $Q_z = \mathbf{0.05}$, $z_x = -3.1$

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
18	3	77.33	0.49	178	2	1	1	0.0857
17	7	196.33	-0.49	**-175**	6	2	5	0.0617
17	8	226.33	-0.47	-170	11	3	10	0.0478
20	2	49.33	-0.45	-163	18	4	16	0.0425
11	12	340.33	0.38	137	43	5	33	0.1483
13	3	72.33	0.33	117	62	6	47	0.2122
12	2	41.33	0.28	100	79	7	56	0.2014
26	1	25.33	-0.26	-95	86	8	62	0.1591
24	8	233.33	-0.24	-85	96	9	68	0.1260

Osiris: $n_G = 8$, $N_G = 177$, $q_B = 0.0452$

$P = 2.85$, $\Theta_R = -82$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
16	2	45.33	-0.28	-101	19	1	18	0.5650
6	7	185.33	-0.16	-57	25	2	23	0.2791
1	10	270.33	-0.33	-120	38	3	39	0.2579
13	12	342.33	-0.07	-25	57	4	55	0.2368
28	7	207.33	-0.44	-158	76	5	76	0.2598
11	4	100.33	0.02	6	88	6	86	0.1935
28	3	87.33	0.46	164	114	7	122	0.3144
17	6	166.33	0.18	63	145	8	148	0.3540

$P = 29.60$, $\Theta_R = 93$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
11	4	100.33	0.27	98	4	1	3	0.1296
6	7	185.33	0.14	51	42	2	43	0.5846
16	2	45.33	0.41	149	56	3	50	0.3949
13	12	342.33	0.45	161	68	4	64	0.3281
17	6	166.33	-0.50	-180	87	5	83	0.3216
1	10	270.33	0.01	5	88	6	86	0.1935
28	7	207.33	-0.11	-41	134	7	137	0.4252
28	3	87.33	-0.17	-60	154	8	151	0.3746

Osiris: $n_S = \mathbf{4}$, $N_S = \mathbf{105}$, $q_B = 0.0381$

$P = 2.85$, $\Theta_R = -141$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
14	5	133.33	-0.40	-145	4	1	3	0.1100
14	3	73.33	-0.46	-164	23	2	18	0.1487
19	4	108.33	-0.18	-63	78	3	52	0.3180
13	3	72.33	0.19	69	150	4	92	0.4665

$P = 29.60$, $\Theta_R = 144$
Periodicity: $z = 3.0$, $Q_z = \mathbf{0.05}$, $z_x = -2.0$

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
14	5	133.33	0.39	139	5	1	4	0.1439
14	3	73.33	0.36	129	14	2	9	0.0437
13	3	72.33	0.33	117	27	**3**	**15**	**0.0178**
19	4	108.33	-0.46	-165	51	4	37	0.0513

Abydos: $n_G = 3$, $N_G = 177$, $q_B = 0.0169$

$P = 2.85$, $\Theta_R = -14$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
18	5	137.33	0.00	0	14	1	22	0.3135
11	4	100.33	0.02	6	20	2	30	0.0915
28	7	207.33	-0.44	-158	144	3	146	0.4507

$P = 29.60$, $\Theta_R = 151$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
18	5	137.33	-0.48	-172	36	1	29	0.3909
11	4	100.33	0.27	98	54	2	43	0.1650
28	7	207.33	-0.11	-41	168	3	159	0.5066

Abydos: $n_S = 2$, $N_S = 105$, $q_B = 0.0190$

$P = 2.85$, $\Theta_R = 3$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
13	3	72.33	0.19	69	66	1	26	0.3935
13	8	222.33	-0.18	-63	66	2	28	0.0990

$P = 29.60$, $\Theta_R = 129$
Weak periodicity: $z = 1.9$, $Q_z = 0.1$, $z_x = -0.8$

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
13	3	72.33	0.33	117	12	1	9	0.1589
13	8	222.33	0.39	141	12	2	12	0.0211

Lion: $n_G = 1$, $N_G = 177$, $q_B = 0.0056$

$P = 2.85$, $\Theta_R = -177$
No periodicity

D	M	g_i	ϕ_i	Θ_i
1	4	90.33	-0.49	-177

$P = 29.60$, $\Theta_R = -24$
No periodicity

D	M	g_i	ϕ_i	Θ_i
1	4	90.33	-0.07	-24

Lion: $n_S = 6$, $N_S = 105$, $q_B = 0.0571$

$P = 2.85$, $\Theta_R = -162$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
24	2	53.33	-0.47	-171	8	1	6	0.2975
18	10	287.33	-0.37	-133	29	2	19	0.2966
26	10	295.33	0.44	158	40	3	28	0.2135
3	8	212.33	0.32	114	84	4	56	0.3987
25	2	54.33	-0.12	-44	118	5	79	0.4735
19	10	288.33	-0.02	-6	156	6	101	0.5207

$P = 29.60$, $\Theta_R = -100$
Weak periodicity: $z = 2.2$, $Q_z = 0.1$, $z_x = -0.1$

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
25	2	54.33	-0.28	-102	2	1	2	0.1110
24	2	53.33	-0.32	-114	14	2	9	0.0899
19	10	288.33	-0.38	-136	36	3	25	0.1692
18	10	287.33	-0.41	-148	48	4	33	0.1172
26	10	295.33	-0.14	-51	49	5	34	0.0425
3	8	212.33	0.06	20	119	6	70	0.2102

Man: $n_G = 5$, $N_G = 177$, $q_B = 0.0282$

$P = 2.85$, $\Theta_R = -27$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
16	10	285.33	-0.07	-25	2	1	5	0.1335
6	5	125.33	-0.21	-76	49	2	60	0.5083
4	5	123.33	0.09	32	59	3	73	0.3404
3	5	122.33	-0.26	-95	68	4	88	0.2378
29	2	58.33	0.28	101	128	5	134	0.3287

$P = 29.60$, $\Theta_R = 3$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
3	5	122.33	0.01	5	2	1	3	0.0824
4	5	123.33	0.05	17	14	2	22	0.1272
6	5	125.33	0.12	42	39	3	53	0.1886
29	2	58.33	-0.15	-53	56	4	72	0.1465
16	10	285.33	-0.48	-172	175	5	172	0.5366

Man: $n_S = \mathbf{6}$, $N_S = \mathbf{105}$, $q_B = 0.0571$

$P = 2.85$, $\Theta_R = -165$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
8	11	307.33	-0.35	-126	39	1	29	0.8185
6	8	215.33	0.37	133	62	2	41	0.6878
4	10	273.33	-0.28	-101	64	3	43	0.4486
30	6	179.33	-0.26	-95	70	4	47	0.2806
7	11	306.33	0.30	107	88	5	60	0.2579
7	5	126.33	0.14	51	144	6	95	0.4610

$P = 29.60$, $\Theta_R = 54$
Periodicity: $z = 3.9$, $Q_z = \mathbf{0.02}$, $z_x = 1.4$

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
7	5	126.33	0.15	54	0	1	1	0.0571
6	8	215.33	0.16	56	2	2	2	0.0033
4	10	273.33	0.12	42	12	3	7	0.0055
7	11	306.33	0.23	83	29	4	17	0.0139
8	11	307.33	0.26	95	41	**5**	**23**	**0.0086**
30	6	179.33	-0.06	-22	76	6	35	0.0135

Flame: $n_S = \mathbf{4}$, $N_S = \mathbf{105}$, $q_B = 0.0381$

$P = 2.85$, $\Theta_R = 123$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
10	7	189.33	0.25	88	35	1	19	0.5219
11	1	10.33	0.44	158	35	2	20	0.1759
11	5	130.33	-0.46	-164	73	3	47	0.2657
7	5	126.33	0.14	51	73	4	50	0.1224

$P = 29.60$, $\Theta_R = 85$
Periodicity: $z = 3.6$, $Q_z = \mathbf{0.03}$, $z_x = 0.0$

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
11	1	10.33	0.23	83	2	1	1	0.0381
10	7	189.33	0.28	100	15	2	10	0.0533
11	5	130.33	0.28	103	17	3	12	0.0094
7	5	126.33	0.15	54	31	**4**	**17**	**0.0034**

Eye: $n_G = 4$, $N_G = 177$, $q_B = 0.0226$

$P = 2.85$, $\Theta_R = -24$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
10	12	339.33	-0.12	-44	21	1	32	0.5188
19	12	348.33	0.04	13	36	2	51	0.3208
8	8	217.33	0.07	25	49	3	63	0.1706
10	4	99.33	-0.33	-120	96	4	111	0.2430

$P = 29.60$, $\Theta_R = 115$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
10	12	339.33	0.35	124	10	1	11	0.2223
10	4	99.33	0.24	85	29	2	24	0.1016
8	8	217.33	0.22	81	34	3	27	0.0225
19	12	348.33	-0.35	-126	119	4	110	0.2381

Eye: $n_S = 5$, $N_S = 105$, $q_B = 0.0476$

$P = 2.85$, $\Theta_R = 81$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
7	7	186.33	0.19	69	11	1	11	0.4153
20	4	109.33	0.18	63	18	2	14	0.1414
3	8	212.33	0.32	114	33	3	25	0.1141
14	11	313.33	-0.25	-88	169	4	96	0.6759
11	11	310.33	-0.30	-107	172	5	101	0.5291

$P = 29.60$, $\Theta_R = 124$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
11	11	310.33	0.37	132	8	1	8	0.3232
14	11	313.33	0.47	168	45	2	26	0.3531
7	7	186.33	0.18	64	60	3	36	0.2446
20	4	109.33	-0.42	-153	84	4	55	0.2660
3	8	212.33	0.06	20	104	5	68	0.2228

Fire: $n_G = 4$, $N_G = 177$, $q_B = 0.0226$

$P = 2.85$, $\Theta_R = 122$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
19	1	18.33	0.25	88	33	1	25	0.4353
29	8	238.33	0.44	158	36	2	31	0.1548
30	5	149.33	0.21	76	46	3	38	0.0542
7	8	216.33	-0.28	-101	137	4	129	0.3336

$P = 29.60$, $\Theta_R = 4$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
29	8	238.33	-0.07	-24	28	1	40	0.5992
30	5	149.33	-0.07	-26	30	2	44	0.2621
7	8	216.33	0.19	68	65	3	81	0.2770
19	1	18.33	-0.50	-180	177	4	173	0.5508

Fire: $n_S = 7$, $N_S = 105$, $q_B = 0.0667$

$P = 2.85$, $\Theta_R = 171$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
11	1	10.33	0.44	158	13	1	6	0.3390
29	4	118.33	0.33	120	51	2	30	0.6033
7	11	306.33	0.30	107	63	3	41	0.5207
23	1	22.33	-0.35	-126	63	4	42	0.3064
23	3	82.33	-0.30	-107	82	5	52	0.2647
10	5	129.33	0.19	69	101	6	68	0.2999
14	11	313.33	-0.25	-88	101	7	72	0.2033

$P = 29.60$, $\Theta_R = 143$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
14	11	313.33	0.47	168	25	1	14	0.6194
10	5	129.33	0.25	90	53	2	38	0.7301
11	1	10.33	0.23	83	60	3	43	0.5533
7	11	306.33	0.23	83	60	4	44	0.3372
23	1	22.33	-0.36	-131	86	5	58	0.3441
23	3	82.33	-0.34	-121	96	6	65	0.2649
29	4	118.33	-0.12	-43	173	7	102	0.5243

Majesty: $n_G = 13$, $N_G = 177$, $q_B = 0.0734$

$P = 2.85$, $\Theta_R = -64$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
2	2	31.33	-0.19	-69	6	1	2	0.1415
18	1	17.33	-0.11	-38	26	2	24	0.5348
9	1	8.33	-0.26	-95	31	3	28	0.3391
5	4	94.33	-0.09	-32	32	4	34	0.2375
19	8	228.33	-0.07	-25	38	5	45	0.2333
2	8	211.33	-0.04	-13	51	6	57	0.2394
24	1	23.33	0.00	0	64	7	68	0.2312
14	2	43.33	0.02	6	70	8	73	0.1662
10	2	39.33	-0.39	-139	75	9	77	0.1111
28	7	207.33	-0.44	-158	94	10	98	0.1826
1	4	90.33	-0.49	-177	113	11	120	0.2667
25	5	144.33	0.46	164	132	12	139	0.3236
9	4	98.33	0.32	114	177	13	176	0.5327

$P = 29.60$, $\Theta_R = 10$
No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
2	8	211.33	0.02	8	3	1	4	0.2630
5	4	94.33	0.07	25	15	2	17	0.3582
2	2	31.33	-0.06	-22	32	3	44	0.6364
1	4	90.33	-0.07	-24	34	4	46	0.4401
9	1	8.33	0.16	59	49	5	61	0.4676
28	7	207.33	-0.11	-41	51	6	68	0.3829
9	4	98.33	0.20	73	63	7	80	0.3729
10	2	39.33	0.21	76	66	8	84	0.2750
25	5	144.33	-0.24	-87	97	9	116	0.4823
14	2	43.33	0.35	124	114	10	130	0.4871
24	1	23.33	-0.33	-119	129	11	142	0.4725
19	8	228.33	-0.40	-146	156	12	161	0.5219
18	1	17.33	0.47	168	158	13	162	0.4119

Majesty: $n_S = 7$, $N_S = 105$, $q_B = 0.0667$

$P = 2.85$, $\Theta_R = -138$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
26	1	25.33	-0.30	-107	31	1	21	0.7652
23	3	82.33	-0.30	-107	31	2	22	0.4364
12	8	221.33	0.47	171	52	3	36	0.4339
16	11	315.33	0.46	164	58	4	41	0.2911
11	1	10.33	0.44	158	64	5	45	0.1788
20	9	259.33	-0.19	-69	68	6	49	0.1060
5	8	214.33	0.02	6	144	7	88	0.3715

$P = 29.60$, $\Theta_R = -169$
No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
16	11	315.33	-0.47	-167	2	1	5	0.2918
20	9	259.33	-0.36	-129	40	2	32	0.6388
23	3	82.33	-0.34	-121	48	3	35	0.4158
12	8	221.33	0.36	129	62	4	48	0.3990
26	1	25.33	-0.26	-95	74	5	55	0.3040
11	1	10.33	0.23	83	108	6	75	0.3840
5	8	214.33	0.12	44	147	7	94	0.4379

Shu: $n_G = 3$, $N_G = 177$, $q_B = 0.0169$

$P = 2.85$, $\Theta_R = 5$

No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
21	3	80.33	0.00	0	5	1	6	0.0975
30	10	299.33	-0.16	-57	62	2	84	0.4176
16	5	135.33	0.30	107	102	3	121	0.3372

$P = 29.60$, $\Theta_R = -158$

No periodicity

D	M	g_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
21	3	80.33	-0.40	-146	13	1	7	0.1128
16	5	135.33	0.45	163	39	2	25	0.0666
30	10	299.33	-0.01	-2	156	3	151	0.4725

Shu: $n_S = 1$, $N_S = 105$, $q_B = 0.0095$

$P = 2.85$, $\Theta_R = 13$

No periodicity

D	M	s_i	ϕ_i	Θ_i
22	10	291.33	0.04	13

$P = 29.60$, $\Theta_R = -99$

No periodicity

D	M	s_i	ϕ_i	Θ_i
22	10	291.33	-0.28	-99

Sobek: $n_G = 1$, $N_G = 177$, $q_B = 0.0056$

$P = 2.85$, $\Theta_R = 25$

No periodicity

D	M	g_i	ϕ_i	Θ_i
11	6	160.33	0.07	25

$P = 29.60$, $\Theta_R = 107$

No periodicity

D	M	g_i	ϕ_i	Θ_i
11	6	160.33	0.30	107

Sobek: $n_S = 3$, $N_S = 105$, $q_B = 0.0286$

$P = 2.85$, $\Theta_R = 161$

No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
26	10	295.33	0.44	158	3	1	2	0.0563
17	1	16.33	-0.46	-164	35	2	20	0.1105
25	8	234.33	0.04	13	148	3	91	0.4838

$P = 29.60$, $\Theta_R = -89$

No periodicity

D	M	s_i	ϕ_i	Θ_i	$\Delta\Theta_i$	n_1	n_2	Q_B
25	8	234.33	-0.20	-73	17	1	13	0.3140
26	10	295.33	-0.14	-51	38	2	24	0.1492
17	1	16.33	0.43	156	115	3	67	0.2998